TRANSACTIONS

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

FOR THE YEAR 1896.

VOLUME XII.,

CONTAINING

PART II. OF THE REPORT OF THE COMMITTEE ON HEALTH RESORTS.

PHILADELPHIA:
PRINTED FOR THE ASSOCIATION.
1896.

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OFFICERS OF THE ASSOCIATION,
1896.

President.

JAMES B. WALKER, M.D., PHILADELPHIA.

Vice-Presidents.

CHARLES E. QUIMBY, M.D., NEW YORK.
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S. E. SOLLY, M.D., COLORADO SPRINGS.

OFFICERS OF THE ASSOCIATION,
1897

President.

E. FLETCHER INGALS, M.D., Chicago.

Vice-Presidents.

SAMUEL A. FISK, M.D., Denver.
JOHN C. MUNRO, M.D., Boston.

Secretary and Treasurer.

GUY HINSDALE, M.D., Philadelphia.

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WILLIS E. FORD, M.D., Utica.
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JAMES B. WALKER, M.D., Philadelphia.

Representative to the Executive Committee of the Congress of American Physicians and Surgeons.

FREDERICK I. KNIGHT, M.D., Boston.
ROLAND G. CURTIN, M.D., Philadelphia, *Alternate.*

CONTENTS.

LIST OF OFFICERS.

Presidents.

Name.	Year.
A. L. Loomis	1884–5.
William Pepper	1886.
Frank Donaldson	1887.
A. L. Loomis	1888.
V. Y. Bowditch	1889.
Charles Denison	1890.
F. I. Knight	1891.
W. E. Ford	1892.
R. G. Curtin	1893.
A. H. Smith	1894.
S. E. Solly	1895.
J. B. Walker	1896.
E. Fletcher Ingals	1897.

Vice-Presidents.

F. I. Knight, W. H. Geddings	1884–5.
Frank Donaldson, Beverley Robinson	1886.
V. Y. Bowditch, R. G. Curtin	1887.
A. Y. P. Garnett, J. T. Whittaker	1888.
J. R. Leaming, E. T. Bruen	1889.
A. L. Gihon, H. B. Baker	1890.
E. L. Trudeau, T. S. Hopkins	1891.
E. Fletcher Ingals, Beverley Robinson	1892.
A. H. Smith, E. O. Otis	1893.
I. Hull Platt, E. L. Trudeau	1894.
John H. Musser, G. R. Butler	1895.
Charles E. Quimby, James A. Hart	1896.
S. A. Fisk, John C. Munro	1897.

Secretaries and Treasurers.

James B. Walker	1884–95.
Guy Hinsdale	1895–97.

LIST OF MEMBERS.

HONORARY MEMBER.

ELECTED

1890. STILLÉ, ALFRED, Philadelphia.

ACTIVE MEMBERS.

1893. ABBOTT, A. C., Laboratory of Hygiene, Univ. of Penna., Philadelphia.
1888. ABBOT, GRIFFITH E., 13½ Street and Pennsylvania Avenue, Washington, D. C.
1890. ALLEN, HARRISON, 1933 Chestnut Street, Philadelphia.
1889. ANDERS, J. M., 1603 Walnut Street, Philadelphia.
1890. ANDERSON, B. P., Colorado Springs, Col.
1890. ATKINS, FRANCIS H , Las Vegas, N. M.

1893. BABCOCK, R. H., Venetian Building, Chicago.
1885. BAKER, HENRY B., 726 Ottawa Street, Lansing, Mich.
1885. BELL, A. N., 337 Clinton Street, Brooklyn.
1896. BERGEY, DAVID H., Laboratory of Hygiene, University of Pennsylvania, Philadelphia, Pa.
1896. BERNARDY, E. P., 221 South 17th Street, Philadelphia, Pa.
1884. BOSWORTH, F. H., 26 West 46th Street, New York,
1885. BOWDITCH, V. Y., 506 Beacon Street, Boston.
1895. BRANDT, C. N., Hot Springs, Va.
1891. BRANNAN, JOHN W., 11 West 12th Street, New York.
1894. BRIDGE, NORMAN, 34 Washington Street, Chicago.
1890. BUCKLEY, J. J., Missoula, Mont.
1896. BULETTE, W. W., Pueblo, Col.
1886. BUTLER, G. R., 229 Gates Avenue, Brooklyn.
1895. BOARDMAN, W. S., 6 Bowdoin Square, Boston.

1896. CAMPBELL, W. A., 38 Bank Building, Colorado Springs.
1894. CHAPIN, FREDERICK W., 102 West 44th Street, New York, and Pomfret, Conn., June–November.
1887. CHAPMAN, S. H., New Haven, Conn.

ELECTED

1894. Coleman, Thomas D., 563 Green Street, Augusta, Ga.
1889. Coolidge, A., Jr., 1 Exeter Street, Boston.
1885. Curtin, R. G., 20 South 18th Street, Philadelphia.

1892. Daland, Judson, 319 South 18th Street, Philadelphia.
1885. Daly, W. H., 135 Fifth Avenue, Pittsburg.
1890. Darlington, Thomas, Jr., King's Bridge, New York City.
1884. Denison, Charles, 823 14th Street, Denver.
1884. Didama, H. D., 424 South Salina Street, Syracuse, N. Y.
1890. Dodge, H. O., Boulder, Colorado.
1896. Dudley, William F., 147 Clinton Street, Brooklyn, N. Y.

1892. Elsner, H. L., Fayette Park, Syracuse, N. Y.
1885. Eskridge, J. T., 204 Equitable Building, Denver, Col.

1887. Fisk, Samuel A., 37 18th Street, Denver, Col.
1885. Ford, Willis E., 266 Genesee Street, Utica, N. Y.
1885. French, Thomas R., 469 Clinton Avenue, Brooklyn.

1896. Gardiner, C. F., 224 Pike's Peak Avenue, Colorado Springs, Col.
1884. Garland, George M., 227 Newbury Street, Boston.
1886. Garnett, A. S., Hot Springs, Ark.
1892. Gibson, William M., 260 Genesee Street, Utica, N. Y.
1884. Glasgow, W. C., 2847 Washington Avenue, St. Louis.
1893. Gray, Landon Carter, 6 East 49th Street, New York.
1891. Griffith, J. P. Crozer, 123 South 18th Street, Philadelphia.

1893. Hance, I. H., 130 West 73d Street, New York.
1896. Hare, Hobart A., 222 South 15th Street, Philadelphia.
1894. Harrington, Mark W., President Washington University, Seattle, Wash.
1891. Hart, James A., Colorado Springs, Col.
1896. Heffron, John L., 448 South Salina Street, Syracuse, N. Y.
1893. Hinsdale, Guy, 3943 Chestnut Street, Philadelphia.
1885. Hopkins, Thomas S., Thomasville, Ga.

1884. Ingals, E. Fletcher, 34 Washington Street, Chicago.

1889. Jacobi, A., 110 West 34th Street, New York.
1888. Jayne, W. A., 217 McPhee Building, Denver, Col.
1886. Johnston, W. W., 1603 K Street, N. W., Washington.

ELECTED

1893. JUDD, L. D., 3603 Powelton Avenue, Philadelphia.

1885. KENWORTHY, C. J., Tryon, N. C.
1890. KELLOGG, J. H., Battle Creek, Mich.
1884. KNIGHT, FREDERICK I., 195 Beacon Street, Boston.
1896. KIMBALL, PAUL T., Lakewood, N. J.

1887. LANGMAID, S. W., 373 Boylston Street, Boston.
1890. LINCOLN, R. P., 22 West 31st Street, N. Y.
1896. LINDLEY, CHARLES L., Lakewood, N. J.
1896. LOOMIS, HENRY P., 58 East 34th Street, New York City.

1894. McGAHAN, C. F., Aiken, S. C.
1887. MAYS, THOMAS J., 1829 Spruce Street, Philadelphia.
1891. MOORE, H. B., Colorado Springs, Col.
1889. MUNRO, JOHN C, 173 Beacon Street, Boston.
1886. MUSSER, JOHN H., 1927 Chestnut Street, Philadelphia.
1890. MULHALL, J. C., 3609 Lindell Avenue, St. Louis.

1895. NEWTON, R. C., 19 North Fullerton Avenue, Montclair, N. J.
1888. NUNN, RICHARD J., 119 York Street, Savannah.

1884. ORME, H. S., Box 1045, Los Angeles, Cal.
1888. OTIS, E. O., 308 Commonwealth Avenue, Boston.

1887. PEALE, A. C., 605 Twelfth Street, N. W., Washington, D. C.
1884. PEPPER, WILLIAM, 1811 Spruce Street, Philadelphia.
1893. PETERSON, FREDERICK, 60 West 50th Street, New York.
1895. PHILLIPS, W. F. R., Weather Bureau, Washington, D. C.
1885. PLATT, ISAAC HULL, Lakewood, N. J.
1887. PLATT, WALTER B., 802 Cathedral Street, Baltimore.

1891. QUIMBY, CHARLES E., 44 West 36th Street, New York.

1891. RANSOM, C. C., 152 West 48th Street, New York (Richfield Springs).
1884. REED, BOARDMAN, Atlantic City, N. J.
1890. REED, JACOB, Colorado Springs, Col.
1885. RICE, C. C., 123 East 19th Street, New York.
1893. RISLEY, S. D., 1722 Walnut Street, Philadelphia.
1884. ROBINSON, BEVERLEY, 37 West 35th Street, New York.
1890. ROBINSON, W. D., 2012 Mt. Vernon Street, Philadelphia.

ELECTED
1896. Rodgers, Mark A., Tucson, Arizona.
1892. Roe, John O., 28 North Clinton Street, Rochester, N. Y.
1890. Rogers, E. J. A., 222 Colfax Avenue, Denver, Col.
1889. Ruck, Karl von, Asheville, N. C.
1891. Ruedi, Carl, 1711 Grant Avenue, Denver, Col.

1884. Schauffler, E. W., 1221 Washington Street, Kansas City.
1896. Schroeder, Henry H., 230 West 135th Street, New York City.
1884. Shurly, E. L , 32 Adams Avenue West, Detroit, Mich.
1890. Smith, A. Alexander, 40 West 47th Street, New York.
1885. Smith, Andrew H., 15 East 38th Street, New York.
1887. Smith, Frank Fremont, St. Augustine, Fla., and Bar Harbor, Maine.
1887. Solly, S. E., Colorado Springs, Col.

1892. Taylor, H. Longstreet, 494 Endicott Arcade, St. Paul, Minn.
1896. Taylor, J. Madison, 1504 Pine Street, Philadelphia, Pa.
1887. Thomas, J. Carey, 228 Madison Avenue, Baltimore.
1885. Trudeau, E. L., Saranac Lake, New York.
1884. Tyndale, J. Hilgard, 91 Second Avenue, New York City.

1884. Walker, James B., 1617 Green Street, Philadelphia.
1885. Ward, Samuel B., 281 State Street, Albany, N. Y.
1891. Watson, E. W., 131 North 20th Street, Philadelphia.
1885. Weber, Leonard, 25 West 46th Street, New York.
1896. Whitcomb, H. H., Norristown, Pa.
1885. Williams, H. F., 450 Classon Avenue, Brooklyn.
1884. Wilson, James C., 1437 Walnut Street, Philadelphia.

Total, 114 Members.

TYNDALE, J. HILGARD,
Removed to Lincoln, Nebraska.

PAST MEMBERS.

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* Deceased.

HONORARY MEMBERS.

*1892. Bowditch, Henry Ingersoll, Boston.
*1890. Lombard, Henri Clermond, Geneva, Switzerland.

ACTIVE MEMBERS.

*1884–85. Armor, S. G., Brooklyn.

1885–91. Barger, D. E., El Paso de Roblis, Cal.
1886–87. Bradley, Edward, New York.
1888–95. Brooks, Leroy J., Norwich, N. Y.
*1884–88. Bruen, E. T., Philadelphia.

*1885–88. Cabell, J. L., Virginia.
1884–94. Camann, D. M., New York.
1888–92. Coan, T. M., New York.
1884–92. Cohen, J. Solis, Philadelphia.
1884–87. Coomes, M. F., Louisville.

1885–88. Dana, C. L., New York.
1890–95. Donaldson, C. P., Muskegon, Mich.
*1884–91. Donaldson, Frank, Baltimore.
1886–88. Donaldson, Frank, Jr., Baltimore.
1887–88. Dougan, D. H., Denver.

1892–96. Edwards, W. A., San Diego.
*1885. Elsberg, Louis, New York.

1890–91. Fisher, Walter E., San Francisco.
1889–91. Flick, L. F., Philadelphia.
*1884. Flint, Austin, Sr., New York.

1890–91. Foster, G. W., Salt Lake City.

*1884–88. Garnett, A. Y. P., Washington.
*1884–92. Geddings, W. H., Aiken.
1887–96. Gihon, A. L., U. S. N. (Retired), New York.
1888–90. Guitéras, John, Philadelphia.

1892–95. Hall, William H., Saratoga, N. Y.
1887–95. Henry, F. P., Philadelphia.
*1879–92. Hodges, W. D., Boston.
*1892. Hooper, Franklin H., Boston.
*1884–87. Hudson, E. Darwin, New York.
1884–95. Hurd, E. P., Newburyport, Mass.
*1892–93. Hutchinson, W. F., Providence.

1885–88. Inglis, David, Detroit.

1890. Janeway, E. G., New York.
*1895. Jarvis, W. C., New York.
*1884–90. Johnson, Homer A., Chicago.
1884–91. Jones, Talbot, St. Paul.

*1885–93. Keating, John M., Philadelphia.
1884–87. Kinsman, D. N., Columbus, O.
*1884–89. Kretschmar, P. H., Brooklyn.

1887–89. Latimer, Thomas, Baltimore.
*1884–92. Leaming, James R., New York.
*1887–93. Levick, James J., Philadelphia.
*1885–94. Longwell, H. R., Sante Fé, N. M.
*1884–95. Loomis, A. L., New York.

1887–90. McDougal, W. D., San José, Cal.
1884. McSherry, Richard, Baltimore.
1884–85. Mason, A. L., Boston.
1886–95. Matthews, Washington, U. S. A.
1890. Millard, H. B., New York.
1884–87. Miller, H. V. M., Atlanta.
1893–95. Mills, C. K., Philadelphia.
*1887–89. Morgan, E. C., Washington.

1886. Osler, William, Baltimore.

1885–92. Page, R. C. M., New York.
*1885–88. Palmer, A. B., Ann Arbor.
*1888–89. Parrish, Joseph, Burlington, N. J.

1885–91. Reed, R. Harvey, Mansfield, O.
1890–95. Robinson, John A., Chicago.
*1884–87. Rochester, Thomas F., Buffalo.
1888–91. Rohé, George H., Baltimore.
1887–89. Roosa, D. B. St. John, New York.

1884–92. Seiler, Carl, Philadelphia.
1884–91. Shattuck, F. C., Boston.
1885–88. Shirmer, G. P., New York.
*1892–94. Stone, W. C., Lakewood, N. J.
*1890–93. Storndart, A. C., Salt Lake City.

*1885–92. Van Bibber, W. C., Baltimore.

*1884–91. Westbrook, B. F., Brooklyn.
1885–89. Whittaker, J. T., Cincinnati.
1887–91. Widney, J. P., Los Angeles, Cal.
1885–92. Williams, G. A., Sharon Springs, N. Y.
*1889–94. Wilson, H. M., Baltimore.
1890–91. Wroth, James H., Albuquerque.

CONSTITUTION AND BY-LAWS.

CONSTITUTION.

Article I.—Name.

This Society shall be known as the American Climatological Association.

Article II.—Object.

The object of this Association shall be the study of *Climatology and Hydrology and of Diseases of the Respiratory and Circulatory Organs.*

Article III.—Membership.

Section 1.—This Association shall consist of *active* and *honorary* members, the latter not to exceed twenty-five (25).

Sec. 2.—Names of candidates for active membership, indorsed by *two* (2) active members, shall be sent to the Secretary at least thirty (30) days before the annual meeting. On approval of the Council, the applicant shall be balloted for at the annual meeting. Three (3) black balls shall be sufficient to reject a candidate. The Council shall have power to nominate active members.

Sec. 3.—The power of nominating honorary members shall be vested in the Council. The election shall be conducted in the same manner as that for active members. Honorary members shall enjoy all the privileges of active members, but shall not be allowed to hold any office or cast any vote.

Sec. 4.—Any member of the Association absent from the meetings, in person or by contributed paper, for three (3) con-

secutive years, without sufficient cause, may be dropped from the list of members by vote of the Council.

Article IV.—Officers.

Section 1.—The officers of this Association shall consist of a *President*, two *Vice-Presidents*, a *Secretary and Treasurer*, who, with five other members, shall constitute the *Council* of the Association.

Sec. 2.—*Nominations.* The officers, including the Council, shall be nominated by a committee of five (5) members, which committee shall be nominated by the President at the first session of each annual meeting, and shall report at the business meeting.

Sec. 3.—*Elections.* The election of officers shall take place at the business meeting. A majority of votes cast shall constitute an election.

Sec. 4.—The President, Vice-Presidents, Secretary and Treasurer shall enter upon their duties at the close of the annual meeting at which they are elected, and shall hold office until the close of the next annual meeting, or until their successors are elected.

Sec. 5.—Members of the Council, other than the President, Vice-Presidents, Secretary and Treasurer, shall hold office for five (5) years.

Sec. 6.—*Vacancies.* Any vacancy occurring among the officers of the Association during the year may be filled by the Council.

Article V.—Duties of Officers.

President and Vice-Presidents.

The President and Vice-Presidents shall discharge the duties usually devolving upon such officers. The President shall be *ex-officio* Chairman of the Council.

Secretary and Treasurer.

As Secretary, he shall attend and keep a record of all the meetings of the Association and of the Council, of which latter

he shall be *ex-officio* Clerk. At each annual meeting he shall announce the names of all who have ceased to be members since the last report. He shall superintend the publication of the TRANSACTIONS, under the direction of the Council. He shall notify candidates of their election to membership. He shall send a preliminary notification of the annual meeting two (2) months previous thereto, and the programme for the annual meeting at least two (2) weeks previous to its assembly, to all the members of the Association. He shall also send notification of the meetings of the Council to the members thereof. At each annual meeting of the Association he shall read the minutes of the previous meeting and of all the meetings of the Council that have been held during the current year.

As Treasurer, he shall receive all moneys due, and pay all debts therewith. He shall render an account thereof at the annual meeting, at which time an auditing committee shall be appointed to report.

ARTICLE VI.—COUNCIL.

The Council shall meet as often as the interests of the Association may require.

Four (4) members shall constitute a quorum.

It shall have the management of the affairs of the Association, subject to the action of the Association at its annual meetings.

It shall consider the claims of candidates recommended to it for admission to membership.

It shall not have the power to make the Association liable for any debts exceeding in total one hundred dollars ($100), in the course of any one year, unless specially authorized by a vote of the Association.

It shall have the entire control of the publications of the Association, with the power to reject such papers or discussions as it may deem best.

It shall have power to nominate active members at the annual meeting.

The Council shall have power to invite any gentleman, not a member, to read a paper at the annual meeting, on any subject within the scope of the objects of this Association.

The Council shall determine questions by vote, or—if demanded—by ballot, the President having a casting vote.

The Council shall constitute a Board of Trial for all offences against the Constitution and By-Laws, or for unbecoming conduct, and shall have the sole power of moving the expulsion of any member.

The President, or any two members, may call a meeting, notice of which shall be transmitted to every member two (2) weeks previous to the meeting.

Article VII.—Papers.

Section 1.—The titles of all papers to be read at any annual meeting shall be forwarded to the Secretary not later than one (1) month before the first day of the meeting, in order to appear on the printed programme.

Sec. 2.—No paper shall be read before the Association which has already been printed or been read before another body.

Article VIII.—Quorum.

A quorum for business purposes shall be ten (10) members.

Article IX.—Amendments.

This Constitution may be amended by a four-fifths ($\frac{4}{5}$) vote of all the members present at an annual meeting, provided that notice of the proposed amendment has been printed in the notification of the meeting at which the vote is to be taken.

BY-LAWS.

1. Meetings of the Association shall be held annually.
2. The time and place of the meetings shall be determined by the Council.
3. The dues of active members shall consist of an annual assessment not to exceed five ($5) dollars. Members in arrears shall not be entitled to vote. Those in arrears for two (2) years

may be dropped from membership by recommendation of the Council.

4. Order of business meeting.

First day:

Calling the roll of members.
Minutes of previous meeting.
Treasurer's report.
Appointment of auditing committee.
Appointment of nominating committee.
Report of Council on recommendations for membership.
Election of members.

Second day—Morning session.

Report of nominating committee.
Election of officers.
Report of the committee on health resorts.
Miscellaneous business.
Adjournment of business meeting.

Any of these By-Laws may be amended, repealed, or suspended by a two-thirds vote of the members present at any meeting.

MINUTES OF BUSINESS MEETING.

THE Thirteenth Annual Session of the Association was called to order at the Laurel-in-the-Pines, Lakewood, New Jersey, on Tuesday, May 12, 1896, by the President, Dr. James B. Walker, of Philadelphia.

The following members were present at the session:

Dr. Harrison Allen, Phila.	Dr. J. C. Munro, Boston.
" R. H. Babcock, Chicago.	" R. C. Newton, Montclair.
" V. Y. Bowditch, Boston.	" E. O. Otis, Boston.
" J. W. Brannan, N. Y.	" A. C. Peale, Wash.
" G. R. Butler, Brooklyn.	" W. F. R. Phillips, Wash.
" A. Coolidge, Jr., Boston.	" I. H. Platt, Lakewood.
" R. G. Curtin, Phila.	" C. E. Quimby, N. Y.
" Judson Daland, Phila.	" C. C. Ransom, N. Y.
" T. Darlington, Jr., N. Y.	" B. Reed, Atlantic City.
" H. L. Elsner, Syracuse.	" W. D. Robinson, Phila.
" Samuel A. Fisk, Denver.	" Schauffler, Kansas City.
" W. M. Gibson, Utica.	" A. H. Smith, N. Y.
" I. H. Hance, New York.	" F. F. Smith, St. Augustine.
" Guy Hinsdale, Phila.	" S. E. Solly, Col. Springs.
" E. F. Ingals, Chicago.	" H. L. Taylor, St. Paul.
" L. D. Judd, Phila.	" J. B. Walker, Phila.
" F. I. Knight, Boston.	" H. F. Williams, Brooklyn.

Guests.

Dr. C. P. Ambler, Asheville.	Dr. H. P. Loomis, N. Y.
" D. H Bergey, Phila.	" M. A. Rodgers, Arizona.
" E. P. Bernardy, Phila.	" John W. Ross, Tenn.
" W. F. Dudley, Brooklyn.	" J. M. Taylor, Phila.
" C. E. Edson, Boston.	" I. Weil, New York.

Dr. James B. Walker then made the Presidential Address, entitled "The Difficulties Attending Climato-therapy."

Dr. Platt welcomed the Association to Lakewood, and gave a concise history of Bricksburg and Lakewood. He said that among the reasons for Lakewood's popularity was its convenience, being in the centre of the largest population of this country, midway between Philadelphia and greater New York; it was absolutely free from malaria, was in the midst of a pine belt on sand of about seven hundred feet in depth, and was free from soil moisture; that the low degree of atmospheric humidity made the days warmer (the time of most importance to invalids), and the nights cooler than those in New York and Philadelphia; that Lakewood was growing less popular as a health resort for the very sick, and more popular as a pleasure resort for the tired or convalescing; that the benefits gained by those in the incipient stages of consumption were very satisfactory. In reply to questions, Dr. Platt described the artesian wells, and especially that of the Laurel House, for which a boring of 750 feet was made; the water from these wells is free to all who wish to take it. The general supply of the village is from the river flowing through Lake Carasaljo, whose head is in the peat-bogs, and which flows through seven miles of pine forests, uncontaminated by either house or barn drainage. He also described the method of sewerage which is conveyed into the river about a mile below the town.

The programme included the following papers:

"Laryngeal Vertigo," by Dr. F. I. Knight, Boston.

"Sensible Temperatures," by Dr. W. F. R. Phillips, Washington.

"Clinical Report of Serious Heart Lesions Without Well-marked Continuous Physical Signs," by Dr. H. L. Elsner, Syracuse.

"Congenital Mitral Constriction as a Cause of Dwarfed Lives and Irritable Heart," by Dr. R. G. Curtin, Philadelphia.

"Febrile Endocarditis in the Aged," by Dr. W. M. Gibson, Utica.

"The Climate of Arizona," by Dr. Mark A. Rodgers.

"The Influence of Climate on Genito-urinary Tuberculosis," by Dr. J. C. Munro, Boston.

"The Treatment of Cervical Adenitis," by Dr. E. Fletcher Ingals, Chicago.

"Mount Pocono, Pennsylvania, as a Health Resort," by Dr. L. D. Judd, Philadelphia.

"Fibrinous Bronchitis," by Dr. John Winters Brannan," New York.

"The Uric Acid Diathesis and its Effect on the Upper Respiratory Passages," by Dr. William F. Dudley, Brooklyn.

Second Day.

"The Present Treatment of Hæmoptysis."

Discussion opened by Dr. Charles E. Quimby, New York, and Drs. Solly, Colorado Springs; Coolidge, Boston; Musser, Philadelphia; Babcock, Chicago.

"The Sanatorium or Closed Treatment of Phthisis," by Dr. E. O. Otis, Boston.

"A Plea for Moderation in Our Statements Regarding the Contagiousness of Tuberculosis," by Dr. Vincent Y. Bowditch, Boston.

"A Rational Basis for Prophylactic Measures Against Pulmonary Tuberculosis," by Dr. David H. Bergey, Philadelphia.

"News—Old News," by Dr. Samuel A. Fisk, Denver.

"A Study of Highly Mineralized Thermal Waters in the Treatment of Disease, Based on Experience at the Glenwood Hot Springs, Colorado," by Dr. Henry H. Schroeder, New York.

"Mechanical Water Filters," by Dr. W. D. Robinson, Philadelphia.

"Pneumonia in Florida," by Dr. Frank Fremont-Smith, St. Augustine.

"A Rare Case of Dissecting Aneurism of the Aorta," by Dr. Judson Daland, Philadelphia.

The President appointed the following Committee on Nominations:

Drs. Knight, Curtin, Platt, Babcock, and Schauffler.

Drs. Darlington and Otis were appointed to audit the Treasurer's accounts.

The Council met and recommended the following for membership:

Dr. Hobart A. Hare, Philadelphia, Pa.
" John L. Heffron, Syracuse, N. Y.
" W. W. Bulette, Pueblo, Col.
" J. Madison Taylor, Philadelphia, Pa.
" H. H. Whitcomb, Norristown, Pa.
" Paul T. Kimball, Lakewood, N. J.
" Charles L. Lindley, Lakewood, N. J.
" Henry P. Loomis, New York City.
" C. F. Gardiner, Colorado Springs, Col.
" Henry H. Schroeder, New York City.
" William F. Dudley, Brooklyn, N. Y.
" David H. Bergey, Philadelphia, Pa.
" E. P. Bernardy, Philadelphia, Pa.
" Mark A. Rodgers, Tucson, Arizona.
" W. A. Campbell, Colorado Springs, Col.

The annual dinner was held on the evening of May 12th, in which fifty-five members and guests participated. The Association was indebted to Mr. Horace Porter, of the "Laurel-in-the-Pines," and to Mr. John Miley, of Lakewood, for the perfect arrangements which characterized this enjoyable occasion. The President acted as toast-master, and Mr. Miley responded in welcoming the Association to Lakewood.

SECOND DAY—*Business Session.*

The Secretary and Treasurer reported that the TRANSACTIONS for 1895 have been distributed to the members, to various medical journals in the United States, and, by the courtesy of the International Bureau of Exchanges of the Smithsonian Institution, free of expense to thirty-two foreign addresses. The volume cost the Association $586. It is not expected that the cost of publication of the TRANSACTIONS for the current year will reach so large a sum.

The changes in membership are:

By death—Dr. R. H. Longwell, of Santa Fé, New Mexico.

By resignation—Drs. C. K. Mills, A. L. Gihon, W. A. Edwards.

By non-payment of dues—Drs. L. Brooks, W. H. Hall, C. P. Donaldson, John A. Robinson.

Sixteen members are proposed for membership.

The Secretary has been in receipt of over two hundred letters and documents during the past year, which have been suitably filed and acknowledged. Notices of our meetings have been inserted in various journals.

It will be of interest to the members to know of the formation of a similar association in England during the past year under the title of "The British Balneological and Climatological Society," the President of which is Dr. Henry Lewis, of Folkestone, England.

The Association is in receipt of a communication from the Medical Association of the District of Columbia requesting aid in combating the passage of a bill before Congress restricting vivisection and animal experimentation in the District of Columbia. It is highly important to the success of the biological laboratories in the various scientific departments of the Government and in the medical colleges of the District, as well as indirectly to similar institutions throughout the United States, that such a bill should not pass, and that we should accede to the request of the medical association sending out the communication.

After a report from the Council the Association then proceeded to ballot for membership. The list of candidates as recommended by the Council (*vide supra*) were elected.

The Auditing Committee reported that they had examined the Treasurer's account and found the same correct.

The Committee on Nominations made their report, and the following were unanimously elected officers of the Association for the ensuing year:

President—Dr. E. Fletcher Ingals, Chicago.

Vice-Presidents—Dr. Samuel A. Fisk, Denver, and Dr. John C. Munro, Boston.

Secretary and Treasurer—Dr. Guy Hinsdale, Philadelphia.

Member of the Council—Dr. J. B. Walker, Philadelphia.

It was moved and seconded and carried that a committee be appointed by the President to represent this Association in opposing the bill pending in Congress to prohibit vivisection or animal experimentation in the District of Columbia. Drs. F. I. Knight and E. O. Otis, Boston, were appointed a committee, and

later submitted the following report, which was forwarded to Washington:

The American Climatological Association wish hereby to join with other scientific bodies of this country in a remonstrance against the passage of any bill by Congress prohibiting or restricting experiments upon living animals in the District of Columbia. They feel that this matter can be safely left in the hands of the gentlemen in charge of the institutions where such experiments are being made. They feel that the one discovery of the antitoxin of diphtheria, which has already saved lives by the thousand, should silence all opposition to vivisection for a century to come. Equally successful means of combating other diseases may be revealed to us at any moment by such experimentation, and, on the other hand, any restriction of such methods might delay such discovery indefinitely.

FREDERICK I. KNIGHT,
EDWARD O. OTIS,
Committee.

MAY 23, 1896.

The business meeting then adjourned.

The members of the Association and the ladies accompanying them then accepted the invitation of Dr. and Mrs. I. H. Platt to luncheon at the Ocean County Hunt and Country Club, where covers were laid for about sixty guests. After luncheon Dr. Platt took the members to drive through Pine Park and around the picturesque Lake Carasaljo.

A vote of thanks was passed by the Association to Mr. Horace Porter, Mr. John Miley, and Dr. I. H. Platt for the exceedingly courteous treatment the Association received and the great pleasure given the members at this famous resort. The Association will hold its next meeting at Washington, D. C., in 1897, as a component part of the Congress of American Physicians and Surgeons.

GUY HINSDALE,
Secretary.

PRESIDENTIAL ADDRESS.

SOME OF THE DIFFICULTIES OF CLIMATO-THERAPY.

By JAMES B. WALKER, M.D.,
PHILADELPHIA.

The trend of medical investigation and of medical energy to-day is in the direction of therapy. For a decade all the activities of the profession seemed to gather about surgery. Trephining, laparotomy, hysterectomy, and their ilk filled our medical journals, almost to the exclusion of all else. The rapid pace could not be continuous, however, and conservatism is calling a halt in some directions at least. Technique alone seems to be left for discussion in surgical matters, apart from the disputes which ever arise between the heroic operator and his more conservative and usually older brother. Therapy is now in the van. The wholesale discovery and presentation of new and active pharmaceutical agents, whose countless additions to our armamentarium are almost bewildering, have added unto them animal extracts ; and nuclein, bone-marrow, various antitoxins, thyroid and other gland extractions fill our societies with discussion, our journals with reading-matter, and the daily newspapers with sensational pabulum. Therapy is, to the medical man, what operations are to the surgeon—the means of relief from diseased conditions. This must ever be the ultimate object of all medical investigation. Koch's bacillus might as well have remained an unknown factor in disease so far as the patient, its host, goes, or so far as his physician is concerned, except as it may illumine the way to its own destruction.

The activity in therapy is not alone expressed in the reme-

dial agents which the laboratories are evolving. More and more is the profession turning toward that *facile princeps*, preventive medicine, and to those so-called "natural agencies" which are so abundantly provided for our invigoration when well and recuperation when sick.

Among these natural agencies stands prominently in the foreground, climate; and climato-therapy is not only claiming more and more serious attention, but is deserving of vastly more than it has thus far succeeded in obtaining.

Ever since our progenitors left the ancestral cradle on the Iranian plateau and scattered to the "four winds of heaven," the race has been battling and dying, growing stronger and weaker, in its efforts at acclimatization. As new countries were conquered and occupied as permanent dwelling-places, the aborigines being annihilated or assimilated, this attempt to accommodate itself to its ever new and mostly varying environment has occupied not a little of the energy of the race, as the restless spirit of enterprise has driven it East or West, North or South.

That the efforts at acclimatization have been successfully accomplished for the race, the survival of the fittest, under all conditions of environment, bears abundant testimony; but that, in the effort, the individual has been abundantly sacrificed, the vast hordes that have succumbed to the various local causes of disease and death bear equal witness. Into the ranks arrive constantly new individuals in every community, who, from inherent or acquired vulnerability, find it impossible to live at peace with their environment; and, as their vulnerability exhibits itself in the form of actual disease, the question must arise, in the management of such an organism, "Is it possible to so fortify him as to lessen his vulnerability and establish his resistance and enable him to successfully battle with his foe in his present environment?" "If not, if he, as an individual, cannot accommodate himself to his environment, can an environment be furnished which, accommodating itself to his requirements, will aid him in the struggle?"

Around this question centre the efforts of the climato-therapist, and in the settlement or solution of it he finds certain difficulties, some of which I shall endeavor to place before you, in the hope that it shall stimulate us to greater efforts to elucidate and simplify this somewhat complex problem, which is the especial object of our Association.

The chief difficulties which the climato-therapist encounters may perhaps be classed under the following heads :

1. The uncertainty of the composition of the agent.
2. Lack of sufficient data concerning many American stations.
3. Difficulty of choice for the individual case.
4. Lack of general information as to the elements of climate affecting health and the consequent lack of ability to wisely use the agent.

1. *The uncertainty of the composition of the agent.* If each health resort had its climatic elements in fairly definite quantity, barring such variations as must be incident to changing seasons, climato-therapy would constitute one of the simplest and plainest of lessons. One could chose, by latitude or isothermal line, the amount of cold desired, and altitude and insular or inland location would do the rest ; but, unfortunately, such is not the state of the case. "The wind bloweth where it listeth" now as in "ye olden time," and at least along seaboards its direction constantly modifies temperature, humidity, and barometric pressure. So far as seaboard resorts are concerned, therefore, only an approximate estimate of the climate to be anticipated can be made ; so that our prescription may be only partially filled, and substitutions, much more serious than those which some pharmacists are said to make, may occur, so completely altering the effect as even to jeopardize life. Each of us can supply incidents from our own experience, some serious, some ludicrous, illustrative of misplaced confidence in climato-therapy. An intimate friend of mine sent a phthisical patient to Marietta, Georgia, to remain during the winter months. She and her attendant arrived there the night before that frost, that

"chilling frost" which extended even to Florida, with destructive effect on the orange-groves. The patient did not wait for further developments, but speedily returned North, where provision is made beforehand for that kind of weather; and thereafter had serious doubts about the wisdom of her medical adviser as to matters climatic. Only this winter I sent a convalescent to a noted Southern resort whose moderate altitude has been ofttimes vaunted as entitling it to be the "all-the-year-around" favorite. I sent her there that she might have more days of sunshine to ride or drive and otherwise recoup her vigor. A few days later, when the vicinity of Philadelphia was mild, pleasant, and open, I received a letter stating that, owing to the snow, they had been unable to enjoy as much out-of-door life as was desirable. They hoped, however, for better things, and, waiting, got them. When even Colorado Springs, that paradise for the phthisical, with Pike's Peak ever at her elbow to freeze any excess of moisture from her diathermic atmosphere, may lie "for seventeen successive days under a canopy of clouds," without a ray of sunshine to idealize her usually unexcelled "invalid's day," one can readily see that climato-therapy presents some problems not easy of solution. This difficulty, however, chiefly affects, to a serious extent, only those cases where short doses of climate are prescribed. Taking the season through, a moderately fair estimate of the climate to be expected may be made; and this, after all, affects most of those cases where it seems to be more particularly an essential element in the treatment. A convalescent, sent for a few weeks to hasten recuperation, to any, and especially seaboard, resorts, may stumble upon exceptional weather and be worse off than if he had remained at home; but the phthisical or the rheumatic who should go for a longer time, or for a permanent residence, will usually find, in the season through, that fair average or mean climatic condition which he seeks.

2. *Lack of sufficient data concerning many, if not all, American stations.* Much has undoubtedly been already accomplished in this direction. The researches of Solly, Fisk, Den-

ison, Ruedi, von Ruck, Orme, Remondini, and others have given us insight into this subject concerning some of our most noted and, perhaps, the most important stations for the climatic treatment of consumptives; but many others have been but imperfectly presented to the profession, and most of those of which we have records have furnished no comparative data, but chiefly the facts concerning one locality alone, giving us no comprehensive view of our climatic stations as a whole, as has been done for European stations by men of wide experience with the different localities.

Agencies are, however, at work in our own country which tend to modify climatic conditions and which necessitate continuous records in order to be enabled to prescribe climate wisely. The removal of large tracts of timber, the irrigation of extensive, almost deserted wastes, and the consequent abundant vegetation resulting, may vary greatly the humidity of a locality and modify decidedly the climatic conditions. Increasing population, producing towns and even cities in a few years, may modify, for better or worse, the pre-existing conditions. Railway facilities and desirable hotels and boarding-houses are annually bringing new resorts for our study, and the absence of the same, place many otherwise most desirable and beneficial localities under ban. Climate, without good food and shelter from vicissitudes, counts for nothing to the chronic invalid in his battle with a mortal foe. The more important health resorts in Europe have not this difficulty to contend with. Their established reputations, with ease of access and thorough adaptation to all of the needs, physical and social, of the invalid, remove this difficulty from the problem. Then, again, their climate is usually more stable, less subject to marked variations, owing to their altitude, like San Moritz and other Alpine stations; their background of mountain range, like places along the Riviera, or their insular position, like Maderia. Time, with the devotion of the medical profession, has done for their resorts what it will do for those of this country. Meanwhile we must wait, and work while we wait. Our own Associa-

tion, besides gathering from its widely scattered membership facts concerning the various stations throughout the country, has an energetic and conscientious committee gathering data which must greatly advance our knowledge of the climatic features at our disposal and place on a more definite basis the absolute facts concerning the different resorts, bared of the tinsel and glitter of hyper-enthusiasts. Professor Moore and Dr. Phillips, of the Government Weather Bureau, have begun, in their monthly issue of a pamphlet on *Climate and Health*, a work which will no doubt be elaborated as time goes on, and prove of incalculable benefit to the climatologist. This work exhibits the climatic conditions for the same period of time of almost a hundred stations scattered over the United States, giving their barometric pressure, temperature, humidity, rainfall, number of days clear, partly cloudy, cloudy and rainy, and the direction and average daily movement of the wind. It also gives reports from about one hundred and seventy-five stations as to the prevailing sickness in these different localities and their surroundings, which will undoubtedly prove of much benefit to the statistician of the causes of disease and the climatic conditions favoring their origin, spread, and mortality.

3. *The difficulty of choice for the individual case.* This constitutes one of the most decided difficulties of the whole subject. It is, at this time, one of the most important points in climato-therapy. It applies alike to our European *confrères* and to ourselves. All therapeusis, however, presents the same difficulty. Remedial agencies of any sort applied to apparently similar cases do not invariably bring the same result. This is especially true of climates. Of two patients, apparently about equally affected with phthisis, and, so far as we can judge, equally promising, under favorable conditions, sent to the same resort and subjected to the same care, one will improve, perhaps recover, and the other may continue uninterruptedly to grow worse, or, improving at first, may later rapidly or slowly decline. Williams tells us of twenty selected cases sent by the Brompton Hospital to Ma-

deira for one winter. Only three improved, one died, and the rest returned to England worse than when they started; and yet these cases were carefully selected by the hospital staff as most likely to benefit by that climate.

Undoubtedly familiarity with the agent enables one to choose the suitable station with fewer errors than those can do who are less familiar with climatic effects. In my opinion the best elucidation yet presented on climato-therapy is to be found in the work entitled *Aëro-therapy*, by C. Theodore Williams, published in 1894. He lays down propositions and conclusions from his most extensive experience, which should greatly help the profession. Although his experience has chiefly been with what to us are foreign stations, he has had some acquaintance with a few of the more important of those of our own country, both through patients whom he has sent and also through a personal visit thereto. The principle that he establishes for the foreign resorts may serve as a foundation for a more rational climato-therapy with us, as the same or markedly similar climates to those which he has chiefly used are to be found within our borders.

4. *Lack of general information as to the elements of the climate affecting health, and the consequent lack of ability to wisely use the agent.* The question paramount in most minds about to employ climate in a given case is, "What is the best climate for phthisical patients?" The question should ever be, "What is the best climate for *this* phthisical patient?" *There is no anti-bacillary climate habitable.* Climate is or may be a factor to aid in resisting disease by recuperating energies or by lessening causes of aggravation. It is a complex factor, variously compounded. It should be prescribed, as any other remedy is prescribed, with knowledge of its constituent elements and with forethought as to the effects of the especial combination on the especial case at hand. The four elements of climate chiefly affecting health are: Temperature, humidity, including sunshine; air movement or wind; and atmospheric pressure, including altitude. As nearly as possible in a given case one should choose that

place whose possession of these constituents in appropriate combination seems best calculated to induce a favorable result. The principal modifying factors of these constituents are due to

1. Distance from the equator.
2. Height above the sea level.
3. Distance from the sea.
4. Prevailing winds.
5. Character of the soil.

It must be apparent that, in our vast extent of continent, bathed on its eastern and western borders by the principal oceans of the earth, extending through the breadth of the temperate zone, and possessed of mountains and plateaus so located as to insure to our patients altitude, with such combination of desirable qualities as are unequalled even in the best of the Alpine stations, I repeat, with such factors for modifying climate we should be, and are, able to find within our own borders and on the islands adjacent all varieties from which to make selection. Our high altitude stations are considered by most authorities as superior to those of the Engadine in many respects, one of which is the absence of wet soil from the melting of snow, it seeming to dry away, owing to the amount of sunshine and the character of the soil. The Engadine at the time of the snow melting, in the spring, is unfitted for consumptives, though they may return later with benefit. One objectionable feature in our Colorado climate is the dust, which makes it more objectionable to irritative mucous membranes than is the Engadine, which, during the winter, is snow-covered. Apart from this feature, however, Colorado and New Mexico present the climate *par excellence* for all cases of phthisis in which altitude is not contraindicated.

Dr. Holland, the English-speaking physician at San Moritz, agrees in the main with C. Theodore Williams and most of our own authorities as to the advantages and contraindications of altitude. The latter writer has formulated the following as his experience of the influence of altitude in phthisical cases :

1. Enlargement of the thorax, unless opposed by fibrosis or by extensive adhesions.

2. Males and females seem to do equally well and profit most between the ages of twenty and thirty, males over thirty and females under twenty being benefited least.

3. The climate is especially beneficial in hemorrhagic cases. (Holland considers that hæmoptysis is not a barrier to high altitude treatment, so that this formerly supposed contraindication is losing supporters abroad as well as with us.) In hereditary cases it seems to exercise a distinctly counteracting influence on the development of phthisis.

4. It is most effective in cases of recent date, though of utility in those of long-standing. To insure benefit, at least six months, and, preferably, two years' stay, is desirable.

5. It produces undoubted improvement in 75 per cent. of phthisis generally, and arrests the tuberculous process completely in 43 per cent.

He considers that its influence is best shown in consolidation, where improvement may be looked for in 87 per cent., and arrest in 57 per cent.

In excavations great improvement occurs in 55 per cent. and arrest in 16 per cent., so far as his cases may be taken as a measure. The *general* improvement of which he speaks consists in improved digestion and assimilation, gain of weight, and return of normal functions, and of color, and of muscular, respiratory, and circulatory power, at the same time that the evidences of disease cease to manifest themselves.

His list of *contraindications* will serve as a basis for decision, and probably applies with equal force to all high altitude climates.

1. Phthisis with double cavities.

2. Fibroid phthisis and *all other conditions where the healthy pulmonary area hardly suffices for respiratory purposes at sea level.*

3. Catarrhal and laryngeal phthisis.

(Holland would include cases with so-called "gastro-intestinal catarrh.")

4. Acute phthisis of all kinds, especially when associated with nervous irritability.

5. Phthisis with pyrexia.

6. Emphysema.

7. Chronic bronchitis and bronchiectasis.

8. Organic disease of the heart and great vessels.

(Holland considers *obstructive* disease to be an absolute contraindication; but, from his experience, if the pulmonary condition warrants the prescription of high altitude for its treatment, *regurgitant* lesion of the heart is no barrier.)

Diseases of the liver and kidneys, including all forms of albuminuria.

9. Disease of the brain and spinal cord.

10. Anæmia. (Holland, on the other hand, has found that anæmia cases, as a rule, do well, especially in summer; whereas the scrofulous do best in winter. This applies especially to children, who should arrive early in the season, before November. Solly's experience supports that of Holland, as to the benefit of high altitudes in anæmia.)

11. Patients too feeble to take exercise.

12. Patients who have degenerated organs from long residence in tropical countries.

In considering the effects of altitude, Williams does not forget a most important adjunct to altitude, to which his patients were subjected, viz.: The careful medical supervision, as practised in the Alpine stations, where most of his cases of this treatment went and where supervision is both easier and more complete than in the Riviera and most of the Southern resorts. His admission on this score corresponds with the repeated and unanimous advice of those familiar with our own high altitude stations—that patients sent to such places should not be left to their own devices in using so potent a remedy, but should be referred to some competent physician, whose familiarity with the effects of altitude may help the patient to avoid deteriorating agencies and to obtain the best results possible by a careful supervision of his life and habits.

Dr. Solly, in a paper read before the American Public Health Association, in Denver, 1895, deals with the hæmatogenetic results from altitude in a thoroughly scientific manner. He quotes from a paper by Dr. Egger, before the Congress at Wiesbaden, 1893, to show the resulting increase in red corpuscles and in the total amount of hæmoglobin in the blood. In other words, the blood, as an oxygen-bearer, is decidedly magnified. Solly concludes, from these studies, which have been verified by studies by Koeppe and Wolf, that we have good reason to believe that there is developed in life at high altitudes a greater power of resistance to the attemped lodgement of germs within the body by means of the increased germicidal character of the more highly oxygenated blood and through the more perfect working of the heart and lungs.

It must be remembered that our resorts at high altitude furnish us not only with the especial stimuli to the respiratory and circulatory functions which attenuated air furnishes, but also less humidity, with its effects on sunshine, and increased power of the sun's rays as well as the roborant effect of cold.

Dr. Ruedi, personally familiar with both the Engadine and the Colorado climate, in a paper read before this Association in Philadelphia, in 1893, giving an elaborate comparison of the two localities, concludes that "in barometric variation, humidity, sunshine, and temperature, Colorado, New Mexico, and parts of Arizona have, in their mountains, natural advantages and climatic conditions which equal or surpass the best European health resorts of this character."

Cases of phthisis, suitable for transplanting climatically, but unsuited for altitude, may find relief in the warm and moist climates of sea voyages. Irritative cases with bronchial or laryngeal catarrh are especially benefited, as also are cases where a neurosis complicates the attack. Insular localities, like Jamaica, may do for us what Madeira serves to do for the Europeans; and, with its mountain ranges, gives an opportunity for a more decided choice and variety than most

islands furnish. The benefits of Jamaica for the phthisical were well presented at the last Pan-American Congress, in the section on climate, by Dr. Wolford Nelson, of New York; Dr. James Henry Clark, of Jamaica; and Dr. James Cecil Phillipps, of Jamaica.

Southern California furnishes a warm climate with less humidity than a sea-voyage, and a varying humidity as the immediate seaboard or higher and dryer points inland are chosen. The station is probably superior to the Riviera, with a somewhat similar climate.

It may be, however, that the continued experience of Trudeau, in the Adirondacks; Bowditch, at Chelsea; Von Ruck, at Asheville, and others, will show that the sanatorium treatment of phthisis, with complete supervision and explicit personal care adapted to the particular case, gives as good results as the climatic, and that the future will not consign the incipient phthisical to a life of exile from home and friends. We await developments of what have already given promising results.

LARYNGEAL VERTIGO.

By FREDERICK I. KNIGHT, M.D.,
BOSTON.

Undoubtedly most of my hearers are familiar with cases of momentary loss of consciousness after cough, to which attention was first directed by Charcot in 1876. Since then cases have been reported and the subject more or less fully discussed by other observers. I myself contributed a paper on the subject to the American Laryngological Association in 1886. The name "laryngeal vertigo," which Charcot applied to these cases, and under which they have since been reported, is an unfortunate one, as in most of them there is no true vertigo. Krishaber and McBride report their cases as "spasm of the glottis," but in most cases there is no evidence of glottic spasm. Gray calls the affection "laryngeal epilepsy," but many cases present no evidence of epilepsy.

It seems to me that the factors concerned in producing the condition are different in different cases, which makes it difficult to find a satisfactory name for it.

If we take a comprehensive view of all cases on record we shall find that the cerebral condition can sometimes be described as syncope, which has been produced by disturbed cerebral circulation, such as we have from long-continued, rapid breathing, and which was formerly employed to produce momentary unconsciousness for minor surgical operations; and sometimes it can better be described as an exhibition of *le petit mal.* In some cases there is not the slightest evidence of epilepsy, and in others we find convulsive movements of the limbs, head and face, and in a few cases mental confusion after the attack.

We shall also find that there is a predisposition to syncope or *le petit mal* in these cases, as shown from their occurrence from other than laryngeal causes. Among the fifteen collected cases which formed the basis of my paper in 1886 there was one (Krishaber's) in which the first loss of consciousness occurred from sudden emotion and was not preceded by cough. Subsequent attacks, though apparently caused by emotion, were preceded by cough ; and Gray's patient had been subject, seventeen years before, after a scalp wound by a bullet, to losses of consciousness like those he had later after cough ; and the patient whose case I shall report to-day had one attack without cough.

We shall find, thirdly, that the exciting causes of these attacks are various. We have to do only with excitation originating at the glottis. This may be due to different conditions, organic or functional. We all remember Sommerbrodt's patient, who was cured of epilepsy by the removal of a pediculated polyp of the larnyx. Spasm of the glottis, or the rapid succession of closures of the vocal cords in coughing, may produce loss of consciousness by disturbance of the cerebral circulation.

I will now relate the case of a patient whom I have seen recently and who excited in me a renewed interest in this affection. A man, fifty-four years of age, took cold at the end of September last, and had had cough since that time till I saw him early in November. He told me that he had had a dozen attacks of loss of consciousness after fits of cough, none of the fits of cough being very severe. He also said that he *had had one attack which was not preceded by cough.* At times he had had twitching of the face and limbs without loss of consciousness. I found nothing marked in the larynx. There were moist râles at the base of the left lung. Pulse 80, very weak. The first sound of the heart was also very weak, suggesting degenerative disease. It seemed to me that the attacks in this case were due to syncope from a weak heart, which any disturbance like coughing

might bring on, though the muscular twitching suggested nervous irritability also.

The points to which I would invite attention and discussion are these :

1. That attacks of loss of consciousness after cough are not all produced in the same way.

2. That the condition may be due to syncope or *le petit mal.*

3. That there is a general predisposition to one or the other of these conditions.

4. That the exciting causes are various, sometimes organic and sometimes functional.

SENSIBLE TEMPERATURE.

By W. F. R. PHILLIPS, M.D.,
WASHINGTON, D. C.

The term *sensible temperature* has been used from time to time in the literature of climatology to express the sensation of atmospheric temperature as distinct from the same temperature as indicated by the ordinary thermometer; in other words, for the temperature felt.

Apparently, shortly after the introduction of the thermometer as a meteorologic instrument and the use of its readings for the purpose of comparing the temperature of the weather at different times and places, it became evident that the degree of atmospheric temperature recorded by the thermometer was not at all times a true index of that felt by the senses. The reasons why the thermometer could not be taken to be a true exponent of the sensation of atmospheric temperature began to be discussed very soon after the recognition of its failure to indicate accurately the sensible temperature, and from time to time different plans were suggested for obtaining a more trustworthy instrumental expression of the temperature felt.

For the most part, the plans suggested consisted of special manipulations or treatments of the thermometer. Several involved the construction of special and peculiar instruments. Most, if not all, of the plans suggested have had points of merit, but each has been defective either in not recognizing all the important physical factors concerned in the determination of sensible temperature or in giving undue weight to some particular feature; and so it is that so far as relates to measuring and expressing sensible temperature we

find ourselves, after the lapse of more than a century's experience, virtually where we were when we first started—still using and still abusing the ordinary thermometer and its indication of temperature sensation.

Apparently the first attempt to correct the defects of the thermometer as a register of temperature sensation was made by Dr. W. Heberden, who, in a paper published in the *Philosophical Transactions* for 1826 of the Royal Society of London, suggested that the way to estimate what he called the *sensible cold* would be to warm a thermometer (assuming that its radiating surface was analogous to that of the human body) "to a height something exceeding the natural heat of the human body, and then to observe at what rate the quicksilver contracted upon exposure to the air." In the same paper Heberden reported four experiments performed after the manner he had indicated. The feature in the experiments that attracted his attention most was the great effect of the wind to increase the rate at which the mercury contracted.

At the meeting of the International Medical Congress, in 1887, Dr. Charles Smart described a plan by which he thought the thermometer could be utilized, not only to indicate the temperature of the air, but also to show how cold it was relatively to the feel. Smart's plan was virtually but an elaboration of that of Heberden's, and was conducted about as follows: A thermometer was heated artifically to 100° F., and exposed for one minute in a calm atmosphere having a temperature below that of the thermometer, and the rate of fall observed and recorded. The next step was to ascertain the effect of wind movement, and this was done by heating the thermometer as in the preceding instance and exposing it to known atmospheric temperatures and wind velocities, and recording the rate of fall taking place in the unit of time. A number of such observations were made under a sufficient diversity of temperatures and winds to fix the rate of fall that would be produced by any atmospheric conditions, so far as wind and temprature were concerned, likely to be encountered. The observed results were then stated in relative

terms, as follows : That a given air temperature and wind velocity would effect as much fall in the thermometer in the unit of time as a certain degree of cold in a calm atmosphere; in other words, the given meteorologic conditions caused the same sensation of temperature that would be caused by a certain degree of cold in a motionless atmosphere. Smart made over one thousand observations in this manner, and from them constructed a table by means of which, being given any air temperature and velocity of wind, the corresponding degree of cold in a calm atmosphere that would cause a like rate of fall could be found by inspection. While making the observations on which his table was based, Smart's attention was, like Heberden's, attracted forcibly to the effect of the wind, so much so that he declared he was able by the rate of fall of the thermometer to tell the velocity of the wind with exactness.

At the Washington meeting of this Association, in 1894, Professor Harrington read a paper on "Sensible Temperature," in which he suggested that the distinction between the temperature of the air as indicated by the thermometer and that felt by the senses was largely due to the evaporation of the watery excretions of the skin and respiratory tract; and he was the first one, I believe, to propose that the wet-bulb thermometer be used as the index of sensible temperature.

In the *Proceedings* for 1875 of the American Association for the Advancement of Science there is published a description of a meteorologic instrument devised by J. W. Osborne, of Washington, D. C., for the purpose of determining the subjective effect of the weather upon the human system, especially with reference to the appreciation of atmospheric temperature. This instrument, to describe it most briefly, consisted of a porous vessel containing water, in which the bulb of a thermometer was immersed. The operation of the instrument was as follows : The water was warmed to 100° F., and the rate of cooling, as indicated by the fall of the thermometer, noted under different exposures. The use of water was to give a substance approximating the specific heat-

capacity of the human body, and the use of a porous containing vessel was to simulate as nearly as possible the more or less moist condition of the skin and respiratory tract. Although Osborne made a number of observations with an instrument of the kind described, they have never been published, and hence their value and that of the instrument remain yet unknown.

At the meeting, in 1892, of the French Association for the Advancement of Science, Piché described a plan for constructing an instrument, for which he proposed the name of a deperditometer, that would express the demands made by the meteorologic environment upon the heat-generating powers of the human body by means of measuring the volume of gas consumed in maintaining for a unit of time a known volume of water at a uniform temperature of 37° C. under different meteorologic conditions. Piché's suggested instrument has not yet become a reality.

A novel method for estimating a general expression of temperature sensation, so far as it has relation to the meteorologic conditions, and which did not involve the use of any meteorologic instruments, was described by Osborne in the *Proceedings* for 1876 of the American Association for the Advancement of Science. This plan was to enlist the services of a number of persons as observers of what was called *subjective temperatures.* Each observer was to record several times daily his impressions of the atmospheric temperature, judged solely from his feelings of personal comfort, and without any consultation with others or with a thermometer. An observation was made by recording the term, selected from a prepared scale, most expressive of the observer's personal feelings with respect to the weather at the moment of observation. The scale from which the term was selected consisted of about twenty expressions in common use in describing our feelings, and was so arranged as to form an ascending series, beginning with "unbearably cold" and ending with "intolerably hot." Each expression on the scale was to be understood to refer to equal gradations of

sensible temperature. Observers were always to take their observations in the shade, in a space as open as possible and free from adventitious draughts.

Osborne put this plan into practical execution for several months during the summer of 1876, but never attempted to correlate the results obtained by it with the prevailing meteorologic conditions.

Using Osborne's subjective temperature observations and the synchronous meteorologic observations of the Signal Service, now Weather Bureau, I made an effort to correlate the two classes of phenomena; but, although finding several striking instances of relationship, was on the whole unable to discover more than a very general agreement. There are, perhaps, a number of causes that contributed to this more or less negative result, which probably may be capable of elimination upon further investigation.

Of the different methods suggested for adoption as the practical index of sensible temperature, that of the use of the wet-bulb thermometer has probably met with more consideration in this country than any of the other suggested methods. This has been due partly, no doubt, because of its relatively greater simplicity and partly because evaporation, which determines the temperature of the wet-bulb thermometer, is well known to be one of the means by which the human body dissipates its surplus heat.

As has already been alluded to, all attempts to establish an instrumental register of sensible temperature have proved failures. It is my purpose in the rest of this paper to point out what seems to me the principal physical factors concerned in the determination of temperature sensation and incidentally to show why failure has so far been inevitable.

The sensation of temperature is ultimately a reflex of the rate of heat dissipation, and is determined by the state of heat exchange between the body and its environments. When the conditions are such that the balance of exchange is in favor of the environment the sensation of cold is experienced; when it is in favor of the body, that of warmth is felt; and when the balance is zero, there is no sensation of

temperature at all, and the judgment of the equality of temperatures between the body and its surroundings is made by the process of exclusion. The intensity of the sensation will be (probably) directly proportional to the size of the heat balance. A rational system of sensible temperature measurement must, therefore, have its foundation upon the physical processes concerned in heat accession and dissipation in so far as these processes are found in connection with the human body.

Physically considered, a body may gain and lose heat by radiation, conduction, convection, and evaporation, either separately or in combination with each other, as the circumstances may determine.

However, in the consideration of these processes as entering into the determination of sensible temperature, we may omit that of conduction in the capacity of a direct agency, because in a gaseous medium, such as surrounds the human body in its ordinary exposure to the weather, conduction is so slight a means of either cooling or heating that it has even been denied existence by many physicists. Indirectly, however, it will have to be considered as an agency in transferring heat from the surface of the body to the surface of the clothing, and *vice versa*, and its effect in thus modifying in a greater or less degree radiation, convection, and evaporation. But this aspect of conduction can hardly be taken to belong properly to sensible temperature as determined by meteorologic surroundings.

If we examine the formula generally given by physicists for calculating the rate of heat loss by means of radiation, convection, and evaporation, and collect together all the different physical terms entering into them, we will find that we have to deal with and properly consider the temperature of the heated body, the temperature of its enclosure, the temperature difference between the two, the atmospheric pressure, the velocity of the wind, the vapor pressure at the temperature of the evaporating water, and the vapor pressure at the atmospheric dew-point. Furthermore, it will become

evident that these several processes of heat loss are not coequal, nor do they maintain a fixed relation the one to the other. Radiation becomes a less and less efficient means of heat loss as the temperatures of the heated body and the enclosure approach each other, and finally ceases when both temperatures become equal. Convection depends, primarily, upon the temperature difference, but also upon the wind movement, and the latter may modify the effects of the former to such an extent that what in an ordinary quiescent atmosphere would be a small convectional effect due to slight temperature difference, may be more than offset by an increased velocity of the wind. The rate of evaporation appears to be a function of the difference between the vapor pressure at the temperature of the evaporating water and that at the atmospheric dew-point, and within certain limits of the velocity of the wind. Evaporation, as occurring in connection with the human body, is also influenced by the rate at which the physiologic functions supply water to the surfaces of the skin and respiratory tract.

The evaluation of these several processes of heat dissipation under any and all meteorologic conditions must constitute the first step taken in the determination of a measure or index for sensible temperature.

When we shall possess in absolute heat units the amount of heat that can be eliminated by the several means already named from the body exposed to different meteorologic conditions we will be enabled to apply this knowledge to that furnished by calorimetric measurements upon the human body, and to state in absolute units the balance of heat exchange as it would exist in the average and normal man. And, as already stated, it must be this balance, positive or negative, with respect to the human body, that determines the sensible temperature and its size the intensity of the sensation.

The several formulas used for stating the physical theories of radiation, convection, and evaporation afford perhaps the avenues by which the evaluations specified are to be reached ; but before we can use these formulas for such purposes it will

be necessary to determine a number of values which will enter as constants into one or more of them.

Some of the values to be determined are the coefficient of emissivity of the skin, the coefficient of the convectional effect of the wind, the coefficient of conductivity of the average seasonal clothing, and the coefficient of sweat excretion under different temperatures.

From what we know of the physiology of the skin, its coefficient of emissivity will vary with the temperature of its surroundings as will also that of sweat excretion. In connection with the rate and amount of sweat excretion it is evident to us all that at low temperatures, for instance, near freezing, the skin is practically dry, while at temperatures near that of the body it is covered with a perceptible amount of moisture; and this difference between the two states is due entirely to the greater excretion of sweat at the higher temperature. The heat lost by cutaneous evaporation will, therefore, be greater in amount the higher the temperature. Although we have no statistical data upon this aspect of cutaneous activity, yet, judging from personal observation and experience, I am inclined to think that evaporation of perspiration does not become in a person at rest an agency of importance in heat loss until the air-temperature rises above 70° F. Above this degree there appears little room for doubting the immense value of cutaneous evaporation as a means of heat elimination; and when the air-temperature rises to or above that of the body, then evaporation is the only means by which the surplus heat can be dissipated and the temperature of the body prevented from passing above the point of physiologic safety.

Upon the solution of the problem of heat elimination as influenced by the meteorologic conditions surrounding the animal body depends not only the possibility of establishing a rational, sensible temperature scale, but also the establishment of medical climatology as a science.

In conclusion, permit me to emphasize the fact that for the time being we have no index of sensible temperature, and the

use of the indications of any one meteorologic instrument for such purpose can only give, under the most favorable conditions, but a rude approximation to the truth and too remote to be of much practical service.

DISCUSSION.

Dr. Andrew H. Smith: Sensible temperature may be regarded as measured by the individual's sensibility to temperature under given conditions. The first question to be considered in this connection is the personal equation. It is impossible for one man to judge of another's sensations in this respect, just as it is impossible to form a judgment of the impression of a color on different retinas. There is no definite ground on which comparisons may be made. It might be that if we could change eyes, what I now consider to be green might be red. Individual reaction to certain temperatures is as various as the number of individuals concerned. For myself I can judge in a room with great accuracy, especially if the temperature is not far from 70° F., but I should not trust my judgment in the open air. It is in a closed room or dwelling that experience comes in, but out of doors experience is no guide, for we cannot make allowances for the changes produced by currents of air, humidity, etc.

It might be possible to train a person so that under fixed conditions he could judge accurately by his sensations as to the thermometric readings, after which, under different conditions, the corrections necessary to make his guesses tally with the thermometer would be a measure of the difference between the sensible temperature and the height of the mercury.

Dr. Phillips: What Dr. Smith said is undoubtedly true, but what it is proposed to determine is not a scale of temperature sensation that will apply exactly to every individual case, but one that will be the nearest obtainable approximation to the temperature sensation of the majority; in other words, a normal. We assume for physiologic purposes that the average or normal weight of a man is about 70 kilogrammes, and perhaps there is not a man in this room who weighs exactly that amount, yet we find our adopted normal very useful. Likewise we have climatic normals, which, when applied to individual events of their particular periods, are more than likely to show a lack of agreement, but we know from the manner in which they have been obtained that they are the most probable

values, and will differ less from all of the individual events than any other values possible to select.

Our first object in the beginning of an investigation is to decide upon a datum mark or zero, from which we may take our departures in whatever directions the nature of the subject investigated admits of or requires.

Mr. Osborne, after giving numeric values to his subjective temperature scale, was gratified to find a very close agreement in the average results. On two very hot days in particular, July 10 and 20, 1876, the averages of the different observers differed less than 0.43 of a division of his arbitrary scale, and the meteorologic conditions upon the two days were almost identical, the only difference being one mile more of wind velocity on the day subjectively the cooler. This very close agreement in the sensations of so many persons with reference to two days, separated by an interval of ten days, during which the meteorologic conditions had fluctuated a great deal, does appear to suggest something more than accident. It has been suggested that by interesting the blind in the matter of subjective temperature observations perhaps more accurate results might be obtained, because in them the psychic influences that undoubtedly affected many of Osborne's observers would be eliminated. I hope to be able to report this plan in operation before long.

In the present state of our knowledge of climatology it will not do for us to attach undue importance to any meteorologic element, for we practically know nothing of medical climatology as a science.

THE SANATORIUM OR CLOSED TREATMENT OF PHTHISIS.

By EDWARD O. OTIS, M.D.,
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The open and the closed or sanatorium treatment of phthisis may not inaptly be compared, I think, to the treatment of a private patient before and after the advent of the trained nurse. With the accurate, intelligent, and skilful ministrations of the nurse, the prognosis for the patient is appreciably improved, other things being equal. In like manner, with the resources and expert service of a sanatorium the percentage of recoveries has been found to be considerably greater than under the most favorable conditions in the open resorts. Besides this chief advantage of better results in the closed treatment there are others which are not inconsiderable, and to them I shall refer directly. All of us who see and treat many cases of phthisis, either in the large centres of population or at the various health resorts, must, it seems to me, have become profoundly impressed, not to say depressed, by the fact that the results obtained by the open treatment, so-called, even under the most favorable environment, are greatly inferior to those produced by the closed treatment as illustrated by the best sanatoriums abroad and the few existing in this country. Of 1022 cases treated by Dettweiler, at Falkenstein, from 1876 to 1886, there were 24.2 per cent. of complete and relative cures; and by relative cure is meant an appearance of good health, with good action of all the organs, especially the heart and lungs, but where there are some physical signs still remaining in the lungs.

Meissen, in his sanatorium at Hohenhonnef, gives 27 per cent. of cures. In Dr. Trudeau's last report of the Adirondack Cottage Sanatorium, of 91 patients who remained from three to forty-four months, 19 incipient and advanced cases were apparently cured, and 26 incipient and advanced cases arrested; in reports of other years he exhibits equally good results. Rompler, at Görbersdorf, gives 25 to 27 per cent. of cures. Von Ruck, at Asheville, reports 35 per cent. cured or permanently arrested; 46 per cent. improved. Turban, at Davos, reports 40 per cent. Knopf gives statistics from fifteen sanatoriums, either visited or communicated with by him, representing 4500 patients; 630, or 14 per cent., were absolute cures; 630, or 14 per cent., relative; and 1890, or 42 per cent., improved. The more intimate our knowledge of the disease and the multiplicity of its pathological conditions, and of the character of the average phthisical individual himself, the more hopeless seems the task of properly treating him, under however favorable a climate, without absolute control both of his body and of his mind. "It is upon a multitude of small details most frequently that the cure depends. In appearance they may seem trifling, but in reality they are of capital importance." The treatment, in a large measure, must consist in causing the patient to give up his bad hygienic habits and replacing them by good ones. The phthisical patient is a sick entity, sick in body and mind. He distorts the true relations of things, and when left to himself frequently acts disastrously from this distorted point of view. His moral and mental condition requires a vast deal of study and observation, which is only possible when he is immediately and constantly under his physician's eye. You, who practise in health resorts, I think, will corroborate these statements, and could doubtless adduce many cases in your own experience as illustrative of them. "A consumptive," says Léon-Petit, "given up to the care of those about him will be at the mercy of anything that may happen. In spite of the frequent visits of his physician, he will have to contend with his own peculiar weakness; he will commit with the best of intentions the gravest faults. His

establishment may be perfect and the climate irreproachable, but he lacks the principal factor of treatment, without which all the others are rendered powerless—namely, the guide which he feels watches him constantly, in whom he has confidence, and who knows how to remove from his path the obstacles which can cause him to stumble." It is emphatically the case, as Dettweiler says, that the individual *in toto* has to be treated, and the moral education is quite as important as the bodily treatment. A consumptive is in a peculiar mental condition as a rule, possibly not different from that which is the concomitant of any chronic depressing disease, but which renders constant supervision and inspiration necessary. He lacks perseverance and power to concentrate his mind and will upon a definite object. In brief, as someone has said, a typical case of phthisis embraces little less than the whole field of pathology.

Moreover, with our present knowledge of the contagiousness of the disease, we must all agree, I am sure, that the sanatoria or special hospitals are the best means of protecting the non-tuberculous. We must reckon with the fact that the people are becoming educated to this new truth, and it will become more and more difficult to properly care for our consumptive patients, either at home or in the health resorts, where both non-tuberculous and tuberculous patients have been in the habit of congregating, as at Aiken, at Asheville, in Southern California, and in various other stations south and west. Those who, simply for a change, or for other maladies than phthisis, resort to these various stations will, as well as the inhabitants themselves of these places, demand that they be protected from the danger of contagion, which is ever present when tuberculous patients are allowed to go free among them. Already hotel proprietors are recognizing this fact and closing their doors to the consumptive. Besides, then, all the other advantages of sanatorium treatment, there will be this other impelling motive of necessity to provide establishments in the health resorts of known reputation for the unfortunate consumptive. The physicians themselves in these resorts, I am sure, realize this necessity, as well as the unsatisfactory condition under which

they are now compelled to treat their patients by the open method, and it is to them especially that we of the cities and portions of the country where phthisis so largely prevails must look to inaugurate the era of sanatoriums. We, on our part, must convince our patients of the much greater chances of recovery they have in a well-equipped and conducted sanatorium, and disabuse them of the erroneous ideas they may hold of the life in such institutions.

Whereas climate is a most valuable factor in the treatment of phthisis, as we would all confess, yet I believe that, both by the profession and the laity, its influence has been, if not entirely overrated, at least quite misunderstood. We have been trying to make it do the whole work rather than its own appropriate part. We have looked upon it too much as a specific. A study of the sanatoria abroad makes it evident, I think, that it is not a peculiar variety or even excellence of climate which has produced the favorable results, but rather the admirable *régime* of the sanatorium itself, and the exact precision with which the whole life of the invalid is governed. It is the perfect hygienic environment. All sources of help, climate among them, are made use of, each according to its value. Knopf says, and I think he is right, that if he had the choice of sending a patient who had some prospect of recovery to an ideal climate and altitude in an open station where he would be left free to act as he pleased, or to send him to a closed institution where all the conditions of climate were those of the lowlands, he would send him to the latter, convinced that his chance of cure in a relatively unfavorable climate, with the *régime*, hygiene, and constant supervision of the physician, was greater than in an ideal climate without those advantages which a sanatorium offers. Our medical journals are constantly publishing communications upon the various so-called climatic resorts which, in my opinion, still further promote this misconception of climate—namely, exaggerating its power and influence, and ignoring the vastly greater value of the hygienic treatment in its largest and fullest sense. It seems to me that it is time to make an emphatic protest against this one-sided

view of the influence of climate *per se*, and an equally vigorous plea for the advantages of the hygienic treatment of phthisis as represented by the best sanatoriums. I do not wish to be understood as in any sense depreciating the value of climate, inestimable as it is. It is only that I believe in it so firmly that I desire to see it properly used and not abused through a misconception of its value. The consensus of opinion of all the experts in the treatment of this disease is that hygiene and dietetics come first, and after that climate, altitude, and medication.

There are certain facts and misconceptions regarding sanatoriums which it seems to me well to consider a little more closely. In the first place, there is a fear abroad that sanatoriums may be a source of contagion not only to the inhabitants of the localities where they are situated, but to the inmates as well. As to the fear that sanatoriums tend to spread the disease, we have the evidence to the contrary from both Görbersdorf and Falkenstein, two of the oldest and largest sanatoriums in Germany. Görbersdorf has been visited by twenty-five thousand patients during forty years, and the mortality from phthisis among the inhabitants has never passed the ordinary average, but, on the contrary, has diminished.[1] During the period of twenty years preceding the establishment of the Falkenstein Sanatorium, an average of 4 per cent. of the inhabitants died annually of consumption, and 18.9 per cent. of the total mortality was attributed to that disease. After the institution was opened, during the period from 1877 to 1894, the average annual mortality from phthisis fell to 2.4 per cent., and the proportion of deaths from consumption to those from all causes sank to 11.9 per cent.[2] On the contrary, there is reason to believe that in the open resorts consumption has increased among the inhabitants since the advent of phthisical patients. This has been observed at Nice, Cannes, Monte Carlo, Mentone, Southern California, and, I doubt not, other open resorts. Says the Director of the hygienic service at Nice, Dr. Ballestre, in a letter to Dr. Knopf: "It is of

[1] Rompler: Beiträge zur Lehre von der chronischen Lungenschwindsucht.
[2] Quoted in the New York Medical Journal, February 22, 1896.

public notoriety that at Nice, and especially Mentone, tuberculosis has increased enormously since consumptives have frequented this station." Knowing, as we do now, the contagiousness of the disease and the carelessness of the average consumptive, how could this be otherwise, for among large numbers of consumptives allowed to go free there will inevitably be some who will scatter their sputum about, and then the danger begins. As to the danger of contagion in the sanatorium itself, we have the experience of Görbersdorf, Saranac, Brompton, and others. At the latter hospital, Williams says that during a long service he has observed only three or four cases of contagion among the *personnel* of the hospital. In the three great closed establishments at Görbersdorf, among the attendants, who are taken almost exclusively from the indigenous population—that is, from an outdoor to an indoor life—the mortality is very low in spite of very exhausting work. In an examination of the dust at the City of London Hospital for Diseases of the Chest, and at the Adirondack Cottage Sanitarium, by Heron and Hance, it was found to be practically free from bacilli. The first and last and constant care in a sanatorium is the proper disposal of the sputum; patients and attendants are taught to realize its danger and the way to protect themselves and others from it; this accomplished, contagion vanishes.

Another common objection to sanatoriums is the depressing effect upon one shut up with so many consumptives. If you suggest sanatorium to your patient or his friends, it is not unlikely that they will consider the proposition as an impertinence on your part, and shudder at the mention of such an institution as a sort of Inferno, with "Abandon hope, all ye who enter here," written over it. This attitude of mind comes from the erroneous conception of a sanatorium, and ignorance of the life within it, together with the desire, perhaps natural enough to average human nature, to conceal from themselves or friends the fact that they have a desperate disease which demands a long and unremitting struggle, aided by the best resources known, to combat it. Those of us who have visited

sanatoriums in this country or abroad will agree, I think, that the atmosphere in these institutions is a cheerful one, the patients are generally happy and contented, and the "hope that springs eternal in the human breast" is fanned into a bright and constant flame. One encourages another, and is encouraged by seeing others recover, and, if the director or physician is the man for the place and possesses something of the personality which makes the success of the faith-cure doctor, he is a constant inspiration to all. The repose of mind engendered in a sanatorium is most helpful. The patient is made to feel that he is wasting no opportunity, and, what is of inestimable value to a sick man, he is encouraged to give himself up entirely to the guidance of the physician and renounce all responsibility of his case. He is only to follow out from day to day the routine of life which is arranged for him, to do blindly, so to speak, what is told him to do, like school-children or athletes training for a contest—a most favorable condition of mind for improvement and recovery. Petit gives the impressions of his own countrymen in a German sanatorium. At first it is a sad one, he says, but this is very fleeting, and is replaced by one which is quite the opposite—a deep serenity of mind begotten by the hope of cure. Thanks to this serenity, the invalids joke and laugh the entire day. "It is hope," adds Petit, "which enters the sanatorium, and it is hope which lodges there."

The educative value of a sanatorium is an important part of its influence. It is no small advantage to train the patient in proper methods of personal hygiene, so that when he enters the common life again he may be able to so care for himself as to avoid the dangers he once fell into by his faulty hygiene. And further, he will also be a teacher to others by precept and example, and show them how to avoid the conditions conducive to phthisis. Upon the consumptive at large and his entourage he will impress the danger of carelessness in disposing of the sputum. We should regard, I think, sanatoriums as most valuable allies to the conservators of public health in disseminating the knowledge of the danger of the sputum and the

means of protection from it, and it is well for us to acknowledge our indebtedness to them.

The educative value of the sanatorium upon the side of its material for clinical study and its laboratory for the investigation of problems in tuberculosis is highly important. Consider the work of Brehmer and Williams, Dettweiler and Powell, Sabourin and Petit. In our own country we must all acknowledge our obligations to Dr. Trudeau for the work he has already accomplished in the Saranac Laboratory, and we have the new laboratory at the Winyah Sanatorium from which to expect valuable results. If special training is necessary for the physician who would direct a sanatorium or devote himself to the treatment of phthisis at large, the sanatorium is the natural school for such training. Dettweiler was a pupil of Brehmer's and Meissen of Dettweiler's. Moreover, many therapeutic problems, the testing of the value or worthlessness of any vaunted drug or method of treatment, can find in such an institution most favorable conditions for their solution. The advantages to the patient in the way of costly equipment the large plant of a sanatorium offers cannot be so completely obtained in any other way, I believe; the sanitary arrangements, cleanliness, ventilation, preparation of food, heating, facilities for various kinds of baths and massage, means of physical culture and breathing exercises, location so as to command the greatest amount of sunshine—all these and others, when dominated by an expert, produce a combination of favoring circumstances rarely if ever possible in an open resort.

There are many details regarding the establishment of sanatoriums which it would be of interest to consider, had one time: the location, climate, altitude, capacity, method of housing, either in a number of small buildings, as at Saranac, or in one or two large ones, as at Görbersdorf and Falkenstein. My thesis, however, is a plea for the greater advantages and better results of the closed treatment rather than a discussion and review of sanatorium location, construction, and management.

I will, however, say a word or two regarding the question of

climate in relation to the location of the sanatorium. With reasonable regard for other considerations, such as accessibility, facility for obtaining supplies, a near source of good and abundant water, etc., the next consideration should be given to climate, and that resort should be selected which offers the most favorable climatic conditions for the open-air treatment: a pure atmosphere, a majority of pleasant and sunny days, dryness of soil and air, and more or less equability of temperature. The medium and high altitudes have given the best results, and, other things being equal, are to be given the preference in the location of the sanatorium. All of those in Europe, with the exception of the three at Davos, Leysin, and Arosa, in Switzerland, are of the medium altitude class—averaging about sixteen hundred and sixty-seven feet. Nearly all of them, however, are situated in the mountains, and possess a mountain air, rather dry, with no sudden or considerable changes in temperature, and fairly abundant sunshine. There are, however, I believe, cases enough more suitable for the lowland climate—Gedding's "aseptic climate without altitude"—as well as those who would do as well there as anywhere, to warrant the construction of sanatoriums in these localities, represented by such places as Lakewood, Aiken, Thomasville, and Southern California. It is well to repeat in this connection that climate and altitude are only more or less favorable allies, only a part of the *tout ensemble* of the treatment of phthisis, and not the *tout ensemble.* Better results are to be expected from sanatorium treatment in a mediocre climate than from the open or free treatment under the most perfect climatic conditions. "Wherever they are situated," says Sabourin, "analogous results are obtained. The tuberculous are cured as well in the temperate climates as in the cold ones. Altitude plays only a secondary rôle in the cure. The best proof of this is that the most excellent results are perhaps obtained at Falkenstein, a station of only an elevation of thirteen hundred and seventy-eight feet, and whose atmosphere is a little misty or foggy. It has often been said," he continues, "and it is well to repeat it, that a climate does not exist which cures

phthisis, but there is a curative method which is applied in a more favorable manner perhaps in one climate than in another. The superb results obtained in the sanatoriums of medium altitudes show that they respond to the indications of a majority of the cases which present themselves."

Are there no cases, then, for which the open treatment is better adapted? one naturally asks. Yes; if one could be psychologist enough to make the selection. Such patients should possess sufficient strength of will, tenacity of purpose, and mental acuteness to comprehend and faithfully and perseveringly carry out a *régime* carefully arranged and supervised for them by a skilled physician close at hand, and, further, their environment should be able to furnish the requisite means for accomplishing this. As a fact, however, I think most of us would agree that such a happy combination of traits and conditions was not frequent, and we can never be sure of knowing with any degree of confidence when it does exist. Consider a moment the requirements: a pure and wholesome atmosphere and constant exposure to it; the best possible hygienic conditions; protection from a new infection either by self-infection or from some other careless patient; good nourishment, with a wholesome, abundant, varied, and attractively served table, the food being especially prepared if the condition demands it, to be constantly under the eye of a specialist in this disease; facilities for proper physical exercise, when allowable; also for hydrotherapy and massage; conditions such as will excite hope and secure tranquillity of mind, and promote co-operation in the exertions made to bring about the favorable results. Can, now, these conditions be fulfilled with any degree of certainty or completeness in a free station? I doubt if they can. Frémy, quoted by Knopf, favors open resorts only for those who have no need of a rigorous supervision and a methodic treatment; the suspected cases—scrofulous, bronchitics, the predisposed, or those who have hereditary tendencies—but, as Knopf says, for a patient with phthisis in evolution, who can aggravate his state by the least imprudence or fault; for one, the constant supervision of

whom, and whose education, physical and moral, constitutes the principal treatment, a closed establishment is the only way in which he can hope for a cure. The treatment in a free station is illusory.

There still remains the important question of sanatoriums for the poor. This is being widely discussed abroad, and already with substantial results, as I shall show directly in presenting a list of the sanatoriums already established and proposed. For the poor consumptives of our cities—and the majority of them are found there—two classes of sanatoriums or special hospitals will be found necessary, I think: the one in or near the city, to receive the tuberculous of all stages; the other in the country, under more favorable climatic conditions, to receive such cases from the former as are suitable for the climatic cure and who have the most need of its influences. When once the public realizes the value and economy as well as protection that such provision for the poor consumptives will effect, they will not be slow to follow the example of the only State which has, as yet, made such beneficent provision.

Ultimately the State has to provide refuge in its general hospitals, poorhouses, and asylums for the consumptive when he is too ill to work longer. Here he is a menace to the other inmates, and receives little, if any, special treatment, although the expense *per capita* is probably larger than it would be in a special hospital. The favorable results are, moreover, almost nothing, while with the special treatment in sanatoriums many lives would be restored to the working community, which would mean a great economic gain.

As illustrative of the subject, I have endeavored to collect a list of all the sanatoriums now existing in Europe and this country, with a few facts relating to them. I have a list of thirty-three—probably there are more at this writing—great and small, scattered throughout Europe, and most of them at a medium altitude. The three in Switzerland are of high altitude, and those in London, at the Isle of Wight, and the little one in Scotland, are at sea level, as are also, I suppose, those,

or most of them, in Russia. Twenty are paying, more or less, and thirteen are charitable. Their capacity varies from two hundred and fifty to fifteen. So far as the results are attainable, they are about the same for all—of absolute and relative cures, from 25 to 30 per cent.; of improved, 40 per cent. or more; or the total minimum of absolute and relative cures and improved, 70 per cent., as calculated by Knopf from forty-five hundred cases. The average duration of residence was from seventy to ninety days.

Besides the sanatoriums already established in Europe, which I have enumerated, there are numerous others, either in process of construction or contemplated, principally for the poor. Switzerland has been especially active in this work. The Canton of Bern has quite or nearly completed one in the village of Schevendi, overlooking Lake Thun, with a capacity of fifty. The Canton Glarus has one projected near Braunwald, with a capacity of twelve to fifteen beds; Bâle, two proposed, one of sixty beds, near the city, and the other at Davos-Dörfli; Zurich, one of eighty to one hundred beds, the situation not yet selected. At Leysin, in the Cantons of St. Gallen, Aargau, and in other portions of the country, like establishments are under consideration. In Germany a number of special hospitals for consumptives have recently been established or proposed at Bremen, Breslau, Dresden, Hanover, Cologne, Frankfort-on-the-Main, Worms, and Stettin, and two in Berlin. At Ruppertshain, near Königstein, one, with a capacity of eighty, is nearly or quite completed. In the neighborhood of Vienna a hospital is to be erected for poor consumptives, with a capacity of a hundred beds. In France, at Angicourt and Magny, sanatoriums are projected, or in process of construction.

Some years ago a Mr. M. O. Motschoutkovsky[1] first advocated the provision of floating sanatoria for people threatened with tuberculous disease or suffering from its incipient forms, and quite lately he has taken up the subject again with renewed enthusiasm. This zealous hygienist is of the opinion

[1] The Lancet, April 4, 1896, p. 939.

Sanatoriums for Phthisis in Europe.

Name.	Situation.	Elevation.	Director.	Paying or non-paying.	Treatment.	Capacity.
Sanatorium of Brehmer.	Görbersdorf in Silesia.	1840 feet.	Achtermann.	Paying.	Brehmer.	250
Sanatorium of Rompler.	Görbersdorf in Silesia.	1840 feet.	Rompler.	Paying	Brehmer.	100
Sanatorium of Countess Pückler.	Görbersdorf in Silesia.	1840 feet.	Weicker.	Small amount.	Brehmer.	30
Sanatorium of Falkenstein.	Falkenstein in the Taunus.	1378 feet.	Dettweiler.	Paying.	Brehmer-Dettweiler.	150
Sanatorium for the Poor at Falkenstein.	Falkenstein in the Taunus.	1378 feet.	Dettweiler.	Non-paying.	Brehmer-Dettweiler.	28
Sanatorium of Davos.	Davos, Engadine Valley (Switzerland).	5159 feet.	Turban.	Paying.	Brehmer-Dettweiler.	60 rooms.
Sanatorium of Hohenhonnef.	In Honef, between Linz and Bonn.	774 feet.	Meissen.	Paying.	Brehmer-Dettweiler.	Largest in Germany.
Sanatorium of Reiboldsgrün	Reiboldsgrün, between Saxony and Bohemia.	2461 to 2625 feet.	Wolff.	Paying.	Brehmer-Dettweiler.	100
Sanatorium St. Blasien.	Black Forest.	2534 feet.	Haufe.	Paying.	Brehmer-Dettweiler.	60
Sanatorium of Badenweiler.[1]	Black Forest.	1378 feet.	Leiser.	Paying.	Not exclusively for phthisis	
Sanatorium of Nordrach.[1]	Black Forest.	....	Walther.	Paying.	....	34
Sanatorium of Schomberg.[1]	Black Forest.	2132 feet.	Bandach.	Paying.		
Sanatorium of St. Andreasberg.	Hartz Mountains.	1968 feet.	Jacubash.	Paying.	Brehmer.	
Sanatorium of Rehburg.[2]	....	492 feet.	Michaelis, Kaatzer	Paying	Brehmer.	15–20
Sanatorium of Neu-Schmecks.	Carpathian Mountains, Austro-Hungry.	3293 feet.	Scontagh.	Paying.	*Cure d'air* and hydropathic; open only in summer.	

[1] Three small sanatoriums in the Black Forest.

[2] Two small sanatoriums.

Sanatorium of Tonsaasen.	Norway.	1968 feet.	Andvord.	Paying.	....	90
Sanatorium of Leysin.	Switzerland.	4756 feet.	Burnier.	Paying.	Usual hygienic.	130
Sanatorium of Arosa.	Engadine, Switzerland.	6188 feet.	Ewart.	Paying.	Brehmer-Dettweiler.	40
Sanatorium of Weissenbourg.	....	2919 feet.	....	Paying.	*Cure d'air* only; hydropathic; Summer.	Mixed.
Sanatorium of Canigou.	Verne-les-Bains, France.	2132 feet.	Sabourin.	Paying.	Hygienic: *cure à l'ombre.* Does not lodge patients.	
Sanatorium of Craigleith.	(near) Edinburgh, Scotland.	Sea-level.	....	Non-paying.	*Cure à l'air libre.*	15
Royal National Hospital.	Ventnor, Isle of Wight.	Sea-level.	Dr. Philip.	Partly charitable.	Eclectic.	134 beds.
Sanatorium of Brompton.	London.	Sea-level.	....	Non-paying.	....	137 beds.
Sanatorium of Victoria Park.	London.	Sea-level.	....	Non-paying.	....	164 beds.
Royal Hospital for Diseases of the Lungs.	London.	....	Dr. Buchanan.	Non paying.		
North London Hospital for Consumption.	London.	Sea-level.	....	Non-paying.	....	84 beds.
Sanatorium of Alexandra.	St. Petersburg, Russia.	....	....	Non-paying.	....	100 beds.
Sanatorium of Obouchowsky.	St. Petersburg, Russia.	....	....	Non-paying.	....	150 beds.
Sanatorium of Alexandrina.	....	....	....	Non-paying.	....	50 beds.
Sanatorium of Finland.	Halila, Finland.	....	Dr. Gabrlowitch.	Non-paying.		
Sanatorium of Slavonta.	Russia.	....	....	....	....	100 beds.
Sanatorium of Ialta.	Crimea, Russia.	....	....	....	One villa devoted to phthisis.	
Hospital de Wola.	(near) Warsaw, Poland.	....	....			

that, sooner or later, his scheme will prove a triumphant success, for, according to his plan, the isolation of a dangerous class can be effectively carried out with very little discomfort to its members, for, by a judicious timing of moves, the sufferers will be afforded an excellent chance of recovery under the best and most favorable climatic conditions. The various anchorages planned have one and all their special seasons, and, as these seasons by no means correspond with each other chronologically, a speedy vessel could easily transport the passengers from one to another, thereby gaining the best results from all. The ships for this service are to be specially constructed, and are to be in employment only during eight or nine months in the year, the remaining time being used to clean and thoroughly disinfect them. Mr. Motschoutkovsky is convinced that no sanatorium in the world could surpass his floating palaces in comfort or salubrity, while, as regards variety and change of scene, there can be no comparison. At the present time the well-known ship-owning association, the Austrian Lloyds, is having a large steamer constructed, especially adapted and fitted for the accommodation of invalids in need of fresh air and favorable climate, and the anchorages that so far have been selected are at Corfu, Alexandria, Palermo, Messina, Naples, Tunis, and Malta.

There are also various hospitals or sanatoriums in Europe for scrofulous or tuberculous children, most of them on the seashore.

Belgium has two—one at Middelkerke, with a capacity of three hundred, and the other at Venduyne, of two hundred capacity. Holland, three—at Zandvort, the Hague, and Wyk-sur-Mer. Italy has thirteen sanatoriums of this kind on the shores of the Mediterranean and seven on the Adriatic. Each of these hospitals takes in a year, on an average, from fifty to three hundred patients. Denmark has the hospital of Refsnaes, which can receive one hundred and thirty sick children. Austria has a marine asylum at Rovigno, near Trieste. Germany, and quite recently Russia, have followed the example of the other countries of Europe. England has the oldest marine hospital

for children at Margate, founded in 1796. France has many hospitals for children on the coast; at Cette, Berck-sur Mer, Cannes, Pen Bron, Arcachon, Banyuls-sur-Mer, Cape Breton, Hyères-Giens, Saint Pol-sur-Mer, Ver-sur-Mer; and in the mountains, that of Ormesson, one hundred beds; Villiers-sur Marne, eighty beds; and Forges-les-Bains; also one at Peyraube in process of construction. At Davos, in Switzerland, the Sanatorium Fredericianum for young boys with tuberculous tendencies was founded in 1878.

Progress in this country in the recognition of the value and importance of the sanatorium treatment for its consumptives is slow, and but comparatively little has as yet been accomplished. A wider knowledge, however, of the contagiousness of tuberculosis and of the valuable means of protection which sanatoriums offer is influencing the public mind to a greater and greater extent, so that we may confidently expect in the near future that, either through selfishness from fear of infection or from philanthropic motives, both the national and State governments, as well as individual beneficence, will be active in promoting the establishment of such institutions. In order to obtain as accurate information as I could, I addressed communications to the State boards of health of all the States, and from a majority of them I have received replies. I find that Massachusetts is the only State that has made any public provision for its poor consumptives, having appropriated last year by legislative enactment $150,000 for a special hospital, which has been located at Rutland, Worcester County, one of the highest points in the State. Of the sanatoriums established by private means as business enterprises or by philanthropy, there are but a few that can be strictly so called. The Adirondack Cottage Sanitarium at Saranac Lake, in the Adirondack Mountains, New York, is a monument to the indefatigable exertions and skill of Dr. E. L. Trudeau, who is its director. This is partly charitable, and is within the reach of persons of moderate means. It has a capacity of about seventy-five. The Winyah, at Asheville, N. C., under Dr. Von Ruck and Professor Klebs, for paying patients, has a capacity of about a hundred. The Sharon Sanitarium, at Sharon, Mass., under the direction of

SANATORIUMS AND PROVISION MADE FOR CONSUMPTIVES IN AMERICA.

State.	Population.	Yearly mortality from phthisis.	Sanatoriums, or provision made by State or private charity.
Alabama,	1,513,017	No statistics; high among the negroes, and low among the whites.	"Hygeia Sanitarium" at Citronelle, Mobile Co., private, under Drs. J. G. Michael and A. C. Klebs, three large buildings with 20, 10, and 8 rooms, and four separate cottages. Open October to May.
Colorado,	412,198	....	None in the strict sense of the word. There is the "Home" in Denver, established by Rev. F. W. Oakes, partly or mostly charitable; "Lyndhurst Sanitary Homes," near Denver; "Glockner" and "Bellevue," paying, near Colorado Springs.
Connecticut,	746,258	1423	None.
North Dakota,	182,719	So far as recorded 6 in 1000.	None.
South Dakota,	328,808	Very little consumption in the State.	None.
Florida,	391,422	For four years, 1891–94, 370 a year.	None.
Idaho,	84,385	No complete statistics.	None.
Indiana,	2,192,404	3442	None.
Iowa,	1,911,896	....	None.
Kansas,	1,427,096	No record kept.	None.
Louisiana,	1,118,587	For New Orleans, 1894, 840; '95, 871.	None.
Massachusetts,	2,238,943	4673	"Sharon Sanitarium," 9 beds, mostly charitable. A consumptive's hospital, established by the State at Rutland, Worcester Co.; "Free Home for Consumptives," Dorchester, 27 beds; soon to be enlarged to 100 beds.
Maine,	661,086	1892 to 1893, 1325 yearly.	None.
Maryland,	1,042,390	....	A small charitable hospital for consumptives in Baltimore.
Michigan,	2,093,889	2964	None.
Missouri,	2,679,184	No vital statistics for the State	None.
Mississippi,	1,289,600	No vital statistics for the State.	None.
New Jersey,	1,444,933	3312	None.

State.	Population.	Yearly mortality from phthisis.	Sanatoriums, or provision made by State or private charity.
New Mexico,	153,593	....	Only by aiding the general hospitals at Las Vegas, Santa Fé, and Silver City.
New York,	5,997,853	For 1895, 13,267; for the past ten years the average percentage was 11.55.	Adirondack Cottage Sanitarium, 75 beds. One just started at Liberty, Sullivan Co. One near Paul Smith's under the Sisters of Charity. Four receive aid from the city treasury, viz., "House of Rest for Consumptives," 40 beds; "St. Joseph's Hospital," 300 beds; "Seton Hospital," 120 beds, and 30 private rooms; "Dispensary for Consumptives," 12 beds; hospitals or pavilions for the exclusive use and isolation of phthisical patients also proposed in New York City.
North Carolina,	1,617,947	Whites, 1.17 per 1000; colored, 3.28 per 1000.	"Winyah Sanitarium" at Asheville, about 100. A movement has just been inaugurated to establish a sanatorium for poor colored consumptives at Southern Pines.
Ohio,	3,672,316	No reliable statistics.	Some kind of a sanatorium at Columbus, with secret treatment.
Pennsylvania,	5,258,014	No system of registration of vital statistics.	A Home for Consumptives at Chestnut Hill, near Philadelphia, a branch of this at the "House of Mercy," for males only; "Rush Hospital for Consumptives and Allied Diseases."
Rhode Island,	345,506	For 31 years, a yearly average of 628.	None.
South Carolina,	1,151,149	No reliable statistics.	None. One to be opened at Aiken in December, 1896.
Tennessee,	1,767,518	No reliable statistics.	None.
Texas,	2,235,523	No reliable statistics,	Small private institution for consumptives at Boerne; also one recently moved there from St. Louis.
Utah,	207,905	Consumption rare among the natives.	None.
West Virginia,	762,794	....	None.
Washington,	349,390	About 340.	None.
Wisconsin,	2,000,000	Nearly 3000.	None.
Wyoming,	60,705	No statistics.	None.
Illinois,	3,826,351	No full vital statistics.	None.
Minnesota,	1,301,826	....	None.
Nevada,	45,761	Not more than 5 a year, and these imported.	None.

Dr. V. Y. Bowditch, has a capacity of nine beds. It has as yet no resident physician. The Hygeia Sanitarium, at Citronelle, Ala., open from October to May, under Dr. J. G. Michael and Dr. A. C. Klebs, for paying patients, has a capacity of about fifty. There are several other institutions scattered about the country for the reception of phthisical patients, but which cannot be strictly classed as sanatoriums: the so-called Home, in Denver, established by the Rev. F. W. Oakes; the Glockner and Bellevue, at Colorado Springs; the Lyndhurst Sanitary Homes, near Denver; a small private institution at Boerne, Texas, not exclusively, however, for consumptives; a Home for Consumptives at Chestnut Hill, near Philadelphia; the Rush Hospital for Consumptives and Allied Diseases, in Philadelphia. The House of Rest for Consumptives, forty beds; St. Joseph's Hospital, three hundred beds; the Dispensary for Consumptives, twelve beds—all in New York City. The Seton Hospital, Spuyten Duyvil, New York City, has one hundred and twenty beds and thirty private rooms.

The Free Home for Consumptives, twenty-seven beds, and soon to be enlarged to one hundred beds, is in Dorchester, Mass. One at Liberty, Sullivan County, N. Y., is soon to be opened, and one near Paul Smith's, Adirondack Mountains, under the charge of the Sisters of Charity, is to be opened within a few months. In Canada one is projected in the Laurentian Mountains; it is to be a national sanitarium and to be built upon the cottage plan.

Through the efforts of the Invalid Aid Society of Boston a bill was introduced into the United States Senate by Senator Gallinger, of New Hampshire, granting to the Society the abandoned Fort Marcy military reservation in New Mexico, for the purpose of a national sanitarium for the treatment of pulmonary disease. Senator Gallinger writes me that the bill is now under consideration by the Committee on Public Lands of the House of Representatives, having passed the Senate; he adds that he has strong hopes that it will become a law. Fort Marcy is about seven thousand feet in altitude, contains seventeen acres, and has good buildings. Fort Union reservation in the same Territory has also been obtained for a private

sanatorium for the exclusive treatment of phthisis. In the report of the Governor of New Mexico for the year ending June 30, 1895, Dr. Francis Crosson, who makes the special report upon the climate of that region, states that plans are now almost complete for the erection of a large sanatorium, to be located either at Santa Fé, Las Vegas, or Ojo Caliente, by a syndicate of physicians of St. Louis, to carry out Dr. Paul Paquin's new treatment of consumption by "immunized serum." He also adds that establishments of a similar character are now in contemplation by the Masonic and Odd Fellows' fraternities.

It seems to me that it is to be deplored that the main object of all sanatorium treatment—namely, the hygienic—should in any way be obscured in these laudable attempts to establish special institutions for the treatment of consumption by the more specious claims of special methods of treatment or specifics. It is well to again repeat that up to the present time there has been discovered no specific which will cure consumption, and the best results have been, and are now, obtained by the hygienic, open-air treatment, as illustrated in the best-equipped and conducted sanatoriums. The extraordinary and unexpected, like the x-rays, may at any time happen in the discovery of the devoutly desired specific or immunized serum; but when it does come, if ever, there will still be as great a need of sanatoriums as at present, where the damage left in the wake of the dislodged and routed bacillus and his confrères can be repaired, and the battered body gently and skilfully restored for further service.

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A PLEA FOR MODERATION IN OUR STATEMENTS REGARDING THE CONTAGIOUSNESS OF PULMONARY CONSUMPTION.

BY VINCENT Y. BOWDITCH, M.D.,
BOSTON.

GENTLEMEN OF THE AMERICAN CLIMATOLOGICAL ASSOCIATION: Recent events in Boston have impelled me to say a few words to you at our annual meeting with the hope that by discussion of the subject we may have some influence directly or indirectly upon the community, especially the laity, in checking what has of late frequently seemed unnecessary alarm about the contagiousness of tubercular disease, especially in its pulmonary form.

In what I am about to say I trust that I shall neither seem to disparage the great advance in medical knowledge due to bacteriology, nor to discourage in any way all reasonable efforts to prevent the spread of tuberculosis. I firmly believe that in another generation we shall see a diminution in the general death-rate from this disease, largely due to the precautions which are so earnestly advocated by the mass of the profession. I only wish to protest against the unreasonable and often, as I deem it, cruel attitude taken by the laity and even by physicians in their desire to prevent the spread of the disease.

Not many weeks ago the people in Boston were treated in their local papers to hot discussions, which have been carried on at the City Hall, relative to the proposed enlargement of a certain institution in the suburbs for the shelter of poor consumptives.

I have been surprised and even shocked to read the state-

ments of some medical men at these hearings, to say nothing of the extravagant words of members of the laity, mostly composed of people living near the institution, who, in their desire to rid themselves of what seemed to them an objectionable neighbor, have given vent to most unwarrantable statements which serve to give the public unnecessary alarm and create that state of constant apprehension which I believe is a potent factor in the production of disease.

The only excuse that I can conceive of for the marked opposition to this special institution is that at one time it was not conducted as a well-regulated hospital for consumptives should be, and that before we knew the importance of destroying the chief source of infection—viz., the sputa—patients were allowed to expectorate upon the grounds about the building, a method which I have lately been told by one of the trustees has been absolutely prohibited on pain of dismissal at the first offense.

Not long after these statements had appeared in the papers I was asked by a layman my opinion upon the subject of the contagiousness of consumption. I told him that doubtless it was a contagious disease under certain conditions, but that with certain precautions, chiefly in the strict care of the sputa, the dangers from contagion were reduced to a minimum. It then came to light that he was one of the opponents of the institution about which such a controversy had occurred, and he almost angrily turned to me and said, "It is abominable that such hospitals should be allowed anywhere in our midst. They are a source of danger to all."

The gentleman seemed to be oblivious to the fact that these same consumptive patients confined in the walls or in the grounds of the institution were an infinitely less source of danger than if allowed to roam at large, spitting in the street-cars, public places, or even in their own homes. His position represents that of thousands who hold the same unreasonable views, and who in their fear of contagion forget the sympathy and kindness due to those who are suffering from consumption, and for these views the extravagant or careless statements, I regret to say, of our own profession are largely to blame.

When a physician asserts that consumption is "as contagious as smallpox," and that "hospitals for consumptives are a source of danger to the whole surrounding community," I consider him culpable for making perfectly unwarrantable statements that cannot be borne out by facts.

It has been proved by observation in the communities near two of the largest sanitaria for consumptives in the world—viz., Görbersdorf, in Silesia, and Falkenstein, near Frankford—that consumption has lessened in amount among the entire population since the introduction of the sanitaria there, largely due, it can justly be said, to the strict hygienic rules which are used at the sanitaria for the disposition of sputa, and which are taught to the inhabitants in the surrounding villages.[1]

It is doubtless perfectly true, on the other hand, that in various "open resorts" for consumptives, where strict methods for disinfection of the hotels and boarding-houses are not enforced, the death-rate among the natives from consumption has increased greatly, the most striking cases being those of Mentone and Nice, where, according to statistics, consumption has greatly increased since the place has become such a common resort for phthisical patients, many of whom through carelessness or ignorance become sources of contagion to others.[2]

Whether this increase of consumption among the natives is due to the lack of strict hygienic rules among the hotels and boarding-houses for phthisical patients in Nice and Mentone or because the native population have changed their former out-of-door occupations to the more confined life of hotel attendants may be justly questioned, and yet the difference between the experience at Mentone and at the two great sanitaria just mentioned is very striking.

In a very interesting paper entitled "A Study of the Infectiousness of the Dust in the Adirondack Cottage Sanitarium,"[3] Dr. Irwin W. Hance has given some results which prove how

[1] Römpler: "Beiträge zur Lehre von der chronischen Lungen Schwindsucht."

[2] (a) Bennett: "On the Contagion of Phthisis Pulmonalis;" (b) S. A Knopf: Letter from Dr. Balestre, quoted in "Les Sanitaria," Traitément et Prophylaxie de la Phthisis pulmonaire, p. 173.

[3] New York Medical Record, December 28, 1895.

little danger there is of infection in properly regulated institutions.

Guinea-pigs were inoculated with the dust taken from various rooms of the sanitarium, and tuberculosis was found to be present only in the animals which had been inoculated with the dust from the room of a careless patient who had been complained of for spitting on the floor, a striking example of the absolute necessity of cleanliness in this particular.

In the large hospital for consumptives at Brompton, London, where the same strict hygienic rules are maintained as at the great sanitaria of Germany, the percentage of hospital attendants who have developed phthisis is very small indeed, according to the statements of Dr. C. T. Williams.

Directly bearing upon the subject in question are the scientific and very important experiments of Delepine and Ransome with reference to the germicidal effect of various substances upon the bacilli of tuberculosis. In these experiments exposure to the full rays of the sun for a comparatively short time (a few hours) proved the most efficient germicide of all, it being sufficient to render the bacilli completely inert; the inoculated animals showing no signs of tuberculosis. The experiments were made, it is important to state, with dried sputa, and not with simple cultures of the bacillus.

They found, moreover, that the one to ten or one to a hundred solution of chlorinated lime proved to be the most efficient method of disinfecting the clothing, the walls, and floors upon which the sputa had been expectorated.

Since the publication of Ransome's paper I have been rather surprised that no other bacteriologists have experimented in this special direction, or at least that I have been unable to find published accounts of such experiments. A. K. Stone and others have proved the extreme vitality of the bacilli when not exposed to the sun, sputa dried for three years in a dark place having produced tuberculosis in animals, but we need the results of more extensive experiments in the direction Ransome has taken, the importance of which in the practical everyday dealing with consumptive patients can hardly be overestimated.

As a result of the experiments of Ransome, it is certainly a legitimate doubt to come to our minds as to how far we need fear infection from sputa which is expectorated onto the open ground exposed to the full rays of sunlight. Not that I would relax one iota in the restriction of the disgusting habit (to say the least) of spitting publicly anywhere; it is only a question as to its danger under the condition of exposure to the sun's rays.

Thus we have scientific facts to help us in trying to show the laity that the consumptive need not be treated like a leper, or as one affected with the plague, but that moderate measures will prevent his being a source of danger to those about him.

It is doubtless natural that the ordinary hotel-keeper should prefer not to receive a guest far advanced in consumption for reasons other than fear of infection, but I have seen too much of the sadness arising from the fairly brutal disregard of the poor sufferer's feelings in some cases not to make me wish to beg for moderation in our statements to the laity, lest we be guilty not only of making assertions not based on scientific truth, but also of adding unnecessarily to the mental suffering of those who are already burdened with physical ills.

I can never forget the pathos of a former consumptive patient of mine, now dead, as he told me of his experience once in an Adirondack hotel, the proprietor of which came to him and told him that he must leave, when feeling forlorn and ill, "because he had a cough," and this instance is but one of many, as almost any specialist for chest-diseases can testify.

In conclusion, let me emphasize my own position in this matter, lest by any chance I should be misunderstood as wishing to relax in methods for perfect cleanliness about the consumptive patient. I advocate most firmly the destruction of the sputa by fire or other methods of disinfection. I believe also that the rooms occupied by a consumptive patient should be thoroughly cleansed with chlorinated lime or carbolic acid; in short, that all reasonable methods should be adopted to kill the germs of the disease, but I wish to refute the statements that *properly regulated* consumptive hospitals are sources of

danger to the community when I believe them to be exactly the opposite, as shown by statistics. I wish also to plead for the consumptive who in his exile is made to feel the forlornness of his condition still more keenly by the selfishness of those who, in their desire to escape the possibility of infection, shut their doors in his face, as it were, utterly regardless of the mental suffering they are inflicting.

Future experimentation will doubtless throw more light upon the subject, but, meanwhile, let us in our zeal as physicians be careful not to make statements which we may be obliged later to retract as not being founded upon scientific truths.

A RATIONAL BASIS FOR PROPHYLACTIC MEASURES AGAINST PULMONARY TUBERCULOSIS.

By D. H. BERGEY, M.D.,
PHILADELPHIA.

The necessity for the institution of rational prophylactic measures against pulmonary tuberculosis has a twofold basis: The one is the fact that as yet we possess no rational and effective therapeutic measures for the treatment of the disease; the other is the still more important fact that the prevention of disease is a far more valuable service to humanity than curing it after it has developed.

In order to establish a rational basis for the prophylactic measures against pulmonary tuberculosis to which I desire to call your attention I shall review, as briefly as possible, the literature containing the experimental evidence on the subject. The value of these measures and the necessity for practising them rest, at present, almost exclusively upon the results of experiments in the laboratory. The statistical evidence of the value of these measures in actual practice is still quite meagre.

Three principal sources of infection have been suggested, in recent times, by different writers: The expired air and the aqueous vapor which it contains, and the sputum.

a. The expired air as a source of infection.

The experimental evidence which seems to give support to the opinion that the expired air of consumptives is a source of infection is quite limited and in every respect of a most unsatisfactory nature. Giboux[1] placed two young, healthy rabbits in a hermetically sealed cage into which he passed each day, at intervals, through a rubber tube, 20 to 25 litres of the expired

air of consumptives. He reports that the animals became tuberculous, but, in the absence of fuller details of the experiments, no great value can be attached to the results. Ransome,[2] as well as Karst,[3] claimed to have found the tubercle bacillus in the moisture condensed from the expired air of consumptives by microscopic examination. Because of the unreliable methods employed by them, and, more especially, because their results remain unconfirmed by the improved methods of to-day, their results cannot be accepted.

The experimental evidence disproving the opinion that the expired air of consumptives is a source of infection is quite considerable, and the results are closely concordant in their nature. Nägeli[4] and Wernich,[5] by means of experiments, established the fact that bacteria do not rise into the air from moist surfaces. Wernich established the additional fact that even in a dry state a strong movement of air—20 m. per second—is required to dislodge bacteria from the objects to which they are attached. Gunning[6] found, as the result of careful research, that the expired air in passing over the moist surfaces of the respiratory passages remains constantly free of bacteria. Celli and Guarniari[7] demonstrated, by microscopic examination and by experiments upon animals, that the expired air of consumptives contained no tubercle bacilli, and that the bacilli did not rise into the air from the tubercular sputum with the moisture evaporated in the process of drying. Kümmel[8] failed to find bacteria in the expired air by means of cultures. Müller[9] found no bacilli on plates moistened with glycerin against which consumptives, whose sputum contained numerous bacilli, had exhaled and coughed, neither in water through which their expired air had been conducted nor in the moisture condensed from it. Sormani and Brugnatelli[10] and Charrin and Karth[11] also failed to find bacilli in the expired air of consumptives.

Tappeiner[12] investigated the question whether in cases of pulmonary tuberculosis with extensive cavity formations it was possible for small particles of tubercular matter to be thrown off in violent paroxysms of coughing. He placed two rabbits

in a closed cage into which he had a person with advanced pulmonary tuberculosis to cough each time during a period of two months. Subsequently, on post-mortem examination, the animals were found to be healthy. Sirena and Pernice[13] and Cadeac and Malet[14] performed experiments on animals essentially like those of Tappeiner and obtained similar results.

In my own experiments[15] on expired air and the moisture condensed from it, I found that, aside from contaminations with common air organisms in a few instances, culture media through which the expired air of healthy persons had been conducted for some time, remained sterile; that the moisture condensed from the expired air of healthy persons and of consumptives, when inoculated into nutrient media, was likewise free of bacteria; neither could any bacteria or epithelial cells be found in the condensed moisture by microscopic experimentation—either in stained or unstained preparations.

From the experimental evidence at hand we may safely draw the conclusion that there is no indication that the expired air of consumptives is a source of infection in any stage of the disease.

b. The aqueous vapor in expired air as an element of danger.

Bollinger,[16] as early as 1879, injected 4 c.c. of the moisture condensed from the expired air of a consumptive into each of several guinea-pigs, and two months afterward, on post-mortem examination, he found tubercular lesions in the animals. On account of the early date of these experiments Bollinger's opinion, with regard to the nature of the lesions found in these animals, cannot be accepted without question, more particularly because his results have not been confirmed by other investigators.

Ransome[17] found a smaller amount of nitrogenous organic matter in the moisture condensed from the expired air of consumptives than in health, while Beu,[18] Renk,[19] Lehmann and Jessen[20] obtained lower results for healthy persons than those of Ransome;[17] the quantity found being dependent upon cleanliness and soundness of the teeth. The results of my analyses of the condensed moisture[15], confirm the ob-

servations of Ransome[17] and Lehmann and Jessen,[20] in that the quantity of nitrogenous organic matter in the moisture condensed from the expired air of consumptives was found to be lower than in health, and that the amount of organic matter found is dependent, very largely, upon the cleanliness of the mouth and soundness of the teeth, and that, most probably, the greater portion of the organic matter given off in the expired air originates from small particles of food lodging between the teeth and there undergo a process of decomposition.

With the method devised by Wanklyn and Chapman[21] as the mean of several analyses, I found the organic matter convertible into ammonia in a litre of the moisture from healthy persons to yield 17.5 mg. of free and 9.0 mg. of albuminoid ammonia; that from a man with a tracheal fistula 0.43 mg. of free and 0.36 mg. of albuminoid ammonia; and that from a consumptive 3.0 mg. of free and 3.4 mg. of albuminoid ammonia. [The results of the several determinations of the oxidizable organic matter and of free and albuminoid ammonia in the moisture condensed from the expired air of healthy persons, the man with the tracheal fistula, and of consumptives are given in the appended tables. Tables I., II., III., and IV.]

From the results of a long series of experiments upon animals, Brown-Séquard and d'Arsonval[22] concluded that the expired air of even healthy persons, as well as the moisture condensed from it, contained a peculiar volatile organic poison which they believed had an important influence in promoting infection, as well as possessing active poisonous properties itself. From its reactions with certain reagents they believed it to be of the nature of a ptomaïne. Würtz[23] also found a volatile base in the condensed moisture and in the blood, which, from its reactions with certain chemical reagents, he considered to be of the same nature as Brieger's ptomaïne. On the other hand, Merkel,[24] Beu,[18] Lehmann and Jessen,[20] Lipari and Crisafulli,[25] Dastre and Loye,[26] Haldane and Smith,[27] v. Hofman-Wellenhof,[28] Raner,[29] Lübbert and Peters,[30] Hermans,[31]

Table I.—Free and Albuminoid Ammonia in Moisture Condensed from the Expired Air.

Man with Tracheal Fistula.

No.	Date.	Time, and am't collected.		Amount of fluid used.	Mgs. per litre of fluid.	
		Hours.	C.c. of fluid.		Free NH_3.	Alb. NH_3.
1	Jan. 16, 1894	....	....	5.0 c.c.	0 4 mg.	0.2 mg.
2	" 16, "	....	....	5.0 "	0.6 "	0.2 "
3	" 19, "	....	....	5.0 "	0.3 "	0.2 "
4	" 19, "	....	....	5.0 "	0.3 "	0.2 "
5	" 22, "	....	....	5.0 "	0.4 "	0.6 "
6	" 22, "	....	....	5.0 "	0.5 "	0.5 "
7	" 25, "	....	....	5.0 "	0.6 "	0.6 "
8	" 26, "	....	....	5.0 "	0.4 "	0.5 "
9	" 26, "	....	....	5.0 "	0.4 "	0.5 "
10	" 29, "	....	....	10.0 "	0.7 "	0.5 "
11	" 30, "	....	....	10.0 "	0.6 "	0.2 "
12	Feb. 1, "	....	....	21.5 "	0.3 "	0.1 "
	Average of 12 analyses				0.43 mg.	0.3 mg.

Healthy Persons.

No.	Date.	Time, and am't collected.		Amount of fluid used.	Mgs. per litre of fluid.	
		Hours.	C.c. of fluid.		Free NH_3.	Alb. NH_3.
1	Dec. 15, 1893	1 hour.	10.0 c.c.	5.0 c.c.	19.8 mg.	5.0 mg.
2	" 20, "	55 min.	10.0 "	5.0 "	31.0 "	4.0 "
3	" 20, "			5.0 "	31.4 "	3.8 "
4	" 28, "	1 hour.	12.0 "	5.0 "	2.6 "	16.2 "
5	" 28, "			5.0 "	2.8 "	16.0 "
6	Jan. 1, 1894	55 min.	8.5 "	4.0 "	24.5 "	4.0 "
	Average of 6 analyses				17.5 mg.	9.0 mg.

Consumptive Persons.

No.	Date.	Time, and am't collected.		Amount of fluid used.	Mgs. per litre of fluid.	
		Hours.	C.c. of fluid.		Free NH_3.	Alb. NH_3.
1	Jan. 18, 1894	1.05 hour.	15.0 c.c.	15.0 c.c.	5.8 mg.	0.3 mg.
2	Feb. 7, "	1.00 "	12.5 "	12 0 "	3.4 "	0.5 "
3	" 13, "	2.00 hours.	20 0 "	15.0 "	2.3 "	3.3 "
4	" 19, "	2.00 "	16 0 "	10.0 "	0.5 "	9.5 "
	Average of 4 analyses				3.0 mg.	3 4 mg.

Table II.—Oxidizable Organic Matter in Moisture Condensed from Expired Air.

Man with Tracheal Fistula.

No.	Date.	Time, and amount collected.		Amount of fluid used.	Mgs. of oxygen per litre of fluid.	Remarks.
		Hours.	C.c. of fluid.			
1	Jan. 31, 1894	1 hour.	3.5 c.c.	3.5 c.c.	8.01 mg.	
2	" 31, "	1 "	4.0 "	4.0 "	11.68 "	
3	" 31, "	1 "	3.0 "	3.0 "	9.34 "	
4	" 31, "	1 "	1.5 "	1.5 "	24.91 "	
	Average of 4 analyses				13.49 mg.	

Consumptive Persons.

No.	Date.	Time, and amount collected.		Amount of fluid used.	Mgs. of oxygen per litre of fluid.	Remarks.
		Hours.	C.c. of fluid.			
1	Jan. 26, 1895	......	7.5 c.c.	7.0 c.c.	6.86 mg.	
2	" 31, "	......	16.0 "	16.0 "	19.32 "	
3	Feb. 2, "	1 hour.	9.75 "	9.75 "	7.50 "	
4	" 19, "	2 hours.	5.0 "	5.0 "	19.12 "	
5	" 28, "	1 hour.	6.25 "	6.25 "	33.90 "	
	Average of 5 analyses				17.34 mg.	

Healthy Persons.

No.	Date.	Time, and amount collected.		Amount of fluid used.	Mgs. of oxygen per litre of fluid.	Remarks.
		Hours.	C.c. of fluid.			
1	Sept. 6, 1894	3 hours.	35.0 c.c.	25.0 c.c.	12.04 mg.	
2	" 12, "	1 hour.	12.0 "	10.0 "	8.89 "	
3	Jan. 29, 1895	⅓ "	4.75 "	4.75 "	18.30 "	4 hours after last meal.
4	" 29, "	⅓ "	4.25 "	4.25 "	2.27 "	½ " " "
5	" 31, "	¼ "	3 75 "	3.75 "	10.40 "	4 " " "
6	" 31, "	¼ "	3.75 "	3.75 "	2.60 "	½ " " "
7	Feb. 1, "	¼ "	4.5 "	4.5 "	7 57 "	3½ " " "
8	" 1, "	⅙ "	3.0 "	3.0 "	8 10 "	½ " " "
9	" 2, "	¼ "	3.8 "	3.8 "	10.105 "	3½ " " "
10	" 2, "	¼ "	3.5 "	3.5 "	15.485 "	½ " " "
11	" 4, "	¼ "	4.0 "	4 0 "	10.90 "	4 " " "
12	" 4, "	¼ "	4.0 "	4 0 "	9.70 "	4½ " " " *
13	" 6, "	¼ "	3.8 "	3.8 "	12.76 "	4½ " " "
14	" 28, "	⅙ "	3.25 "	3.25 "	8.83 "	3½ " " "
15	" 28, "	⅙ "	2.75 "	2.75 "	3.47 "	4 " " " *
16	Mar. 1, "	⅙ "	2.5 "	2.5 "	7.56 "	4 " " "
17	" 1, "	⅙ "	2.75 "	2.75 "	3.47 "	½ " " "
18	" 2, "	¼ "	3.75 "	3.75 "	2.62 "	3 " " "
19	" 2, "	¼ "	3.25 "	3.25 "	1.515 "	3½ " " " *
20	" 2, "	¼ "	4.0 "	4.0 "	1.23 "	½ " " "
	Average of 20 analyses				7.93 mg.	

* Indicates that the mouth was cleaned before collecting the fluid.

as well as myself,[15] were unable to find positive evidence of the presence of a volatile organic poison in the moisture condensed from the expired air by means of experiments upon animals; Merkel,[24] Lehmann and Jessen,[20] Lipari and Crisafulli,[25] and myself[15] also failed to find this volatile organic poison in the condensed moisture by means of the reagents and methods which have been employed by Brown-Séquard and d'Arsonval,[22] and by Würtz.[23] The only reaction which I was able to obtain was with Nessler's reagent, indicating the presence of ammonia.

As indicated by the results of the more recent investigations on the nature and composition of the aqueous vapor in expired air, we may conclude that this constituent of the expired air of consumptives is incapable of conveying the disease from the sick to the well. The results of the more recent investigations also indicate that, most probably, this constituent of the expired air, either in health or disease, possesses no deleterious influence to health.

c. Tubercular sputum as a source of infection.

It remains for me to present the experimental evidence as to the possibility of and the modes in which tubercular sputum becomes a source of infection. Besides the discharges coming from the bronchi and lungs, the discharges from the entire respiratory tract may also contain the tubercle bacillus and prove a source of infection. Infection through the discharges of the respiratory apparatus may occur directly by contact or indirectly through the medium of infected articles which had been brought in contact with the discharges or with the consumptive himself.

In addition to these modes of transmission of the infectious material, I shall consider at some length the experimental evidence as to the great danger of infection from dried tubercular sputum. From the fact that this mode of transmission is so insidious in its nature it is of far greater importance than the others, and it is probably less generally recognized as being a frequent mode of transmission, especially by those who have not made the subject a special study. As long as the sputum

remains moist it is not a source of danger except through direct or indirect contact, but after its moisture has evaporated and it has been pulverized to impalpable dust-particles, it is in a condition to become a source of danger. These minute particles of dust, floating in the air of a room, or of the street, find access to the respiratory passages of those breathing the air.

The relative number of tubercle bacilli in the air and dust of infected houses is too small to render their detection possible through microscopic examination. Their growth in nutrient media is also too slow to detect them by this method, as a rule, because of the presence of hosts of other bacteria which grow rapidly and thus mask the growth of the tubercle bacillus, or inhibit its growth entirely. The method commonly employed to detect the tubercle bacillus in the dust of infected houses, in which the results are at all satisfactory, is by the inoculation of a small amount of the dust into susceptible animals with the idea of conveying the disease to them. Guinea-pigs have been found most susceptible to tubercular infection, and these are now employed for such experiments.

The experimental evidence as to the infectious nature of the air of houses containing tubercular sputum in the form of impalpable dust is quite extensive and most positive in character. The presence of the germs of tetanus, malignant œdema, besides other septic bacteria, proves a serious obstacle to our efforts to produce tubercular infection in animals by inoculating them with the dust of infected houses. A large proportion of the animals inoculated with the dust die from different forms of septic infection long before the tubercle bacilli have had an opportunity to develop their characteristic lesions. But we have discovered measures by which we can overcome to a great extent this serious obstacle, and now have abundant experimental evidence that, under favorable circumstances, the tubercle bacillus retains its vitality and virulence for a long time in the dried and pulverized sputum.

The infectious nature of the dust of rooms occupied by consumptives has been established very satisfactorily by the experiments upon animals of Celli and Guarniari,[7] v. Wende,[32]

Baumgarten,[33] and more particularly by those of Cornet,[34] Kirchner,[35] and Hance,[36] within recent years. Of 392 guinea-pigs inoculated by Cornet[34] with infected dust from hospitals, insane asylums, jails, and dwellings, 59 became tubercular. He found that the infectious nature of the dust of rooms occupied by consumptives is influenced directly by the manner in which the sputum is collected. Where the patients expectorate upon the floor or into a handkerchief the dust of such rooms is far more infectious than that of the rooms in which the sputum is carefully collected in a spit-cup and subsequently disinfected or destroyed. From the results of his experiments he draws the conclusion that if the sputum of consumptives is carefully collected in spit-cups and subsequently disinfected or destroyed, the danger of infection is greatly lessened. The spit-cup, as well as the place where it stands, must also be disinfected. The patient must be taught to collect his sputum in such a manner as to avoid the infection of his clothing and body. By exercising such precautions, he asserted it would be possible to limit the spread of tuberculosis to a marked extent.

Kirchner[35] found, as the result of his experiments upon animals with the dust of infected houses, that where prophylactic measures, as recommended by Cornet,[34] were carefully carried out, the animals were not infected. When, however, these prophylactic measures were neglected the dust from such rooms produced tubercular infection in the inoculated animals. The prophylactic measures which he recommended are: The collection of the sputum in suitable receptacles and its subsequent disinfection or destruction; careful disinfection of the spit-cup, as well as its immediate surroundings; the disinfection of all articles that may become infected through coming in contact with the patient; and the cleansing and disinfection of the hands of the nurse immediately after handling the patient or the spit-cup. When such precautions are not taken with the sputum and other infectious discharges there is danger of infection, especially to the nurse. Hance[36] was also able to demonstrate that where prophylactic measures were neglected the dust of the houses was capable of conveying the disease to

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"NEWS—OLD NEWS."

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At the meeting of this Association held in Baltimore in 1887, the discussion was devoted almost entirely to Bergeon's method of treating consumption, and one listening to the reports would have believed that, at last, a specific had been found for the cure of that dread disease. At this date we know how far from true that idea was. A few years later Koch's tuberculin was heralded as the eradicator of pulmonary consumption, and it, too, has been tried and found wanting. Various modifications of this tuberculin have been advanced, and their efficacy has not been admitted. Quite recently the papers have announced with the blast of trumpets the arrival of a second Jenner, come to save the human race, and yet the medical world remains somewhat skeptical. Unquestionably, however, there is a hope occupying the minds of men that some remedy will be found that will blot out pulmonary tuberculosis just as vaccination has blotted out smallpox.

Meanwhile, in this mad rush in search of a specific, it has seemed to me that we are in great danger of neglecting the old and well-tried methods which have been found to be of avail; and that our patients are likely to suffer in consequence. So, it may do no harm to call a halt occasionally, and review what we have learned.

To start with, it should be constantly borne in mind that pulmonary consumption is the most fatal of all diseases. It leads the list as the destroyer of mankind. One hundred and thirty-odd thousand lives in this country alone sacrificed to

this disease is a startling fact and may well give us pause. We should ever bear in mind the fatality of the malady. The combat is a gigantic one. The foe is worthy of our steel. It is a fight to the finish. Here and there cases are recorded that are exceptions, but in the main the rule holds true that pulmonary tuberculosis tends to run an unfavorable course from bad to worse, with death as the goal.

It is well for the physician to bear this constantly in mind; whether it be advisable so to inform the patient is quite another question. In my own practice, I deem it of prime importance that my patient should understand the gravity of the situation. The old adage of "Forewarned is forearmed" I hold to apply to the treatment of this disease. I find that ignorance is apt to lead to imprudence and dire results; while a just appreciation tends to a hearty co-operation in the method of treatment on the part of the patient. The information can be conveyed in such a way as to carry with it the hope that will stimulate, rather than the dread which destroys. I recognize that the conditions are different with the Eastern practitioner, and that a direct statement of facts on a first visit would be likely, in many instances, to prove a blow between the eyes, which would so stun the patient as to deprive him of the power of action; and that, in many instances, better results can be obtained by a milder, a more gentle handling. Nevertheless, sooner or later, I think, the patient should understand his condition, so that he will lend a heartier support in the efforts to get the better of it.

Recognizing, then, the gravity of the disease, it is of the highest importance that an early diagnosis should be made in every case. One should familiarize himself with the early signs and symptoms of pulmonary consumption. They may not be as "deep as a well, nor as broad as a church door, but they are enough," they will do. The acute ear will be on the watch for the early click developed, it may be, on cough; for the prolonged blowing expiration; the lengthened percussion-note; and he will not disregard these signs because they are found at the interscapular space, or in that part of the lung

over the region of the heart, or at the angle of the scapula behind, rather than at the apex. The physician who is on the alert will not always regard the chills and fever as due to malaria; nor will he construe the loss of appetite as due to simple debility. It may be that he will not even wait for the detection of the bacillus before he has made his diagnosis.

Early diagnosis of this condition cannot then be too strenuously insisted on. One does not wait until the prairie is on fire before he attempts to extinguish the flames. If there is a fire in the basement of your house, you put it out and do not wait for it to reach the upper stories before you begin to fight it. Why, then, should you delay with so fatal a disease as consumption? It will almost certainly climb to the upper stories and destroy the building if left to itself; so, stamp on it at the very start, put it out in the early stages. Use no half-way uncertain method, but, recognizing the gravity of the situation, bearing in mind the inevitable outcome, try to extinguish the first sparks.

How can this best be done? Has success attended the home treatment of the disease? Have drugs and home comforts taken the place of change of climate, or done anything but fatten the pocket-book of the physician, or coddled the patient through a steadily progressing malady and onward and distressing decline to the grave?

To-day, whatever may come in the future, change of climate stands as the well-recognized treatment for pulmonary tuberculosis. True, it does not cure in every instance. But, what treatment is unfailing in any disease? Persons have smallpox two and three times, and even may be afflicted though properly vaccinated. Antitoxin does not save every case. Why then should we neglect climatic change because some try it and fail? Nor is the argument that some get well at home to prevail. They are the very rare, the exceptional cases, and should not weigh against the immense number who do not recover, but who sink steadily, steadily to the end. I have known typhoid patients to eat beefsteak and recover, but I do not want to be treated that way, if it is ever my misfortune to

have that disease; nor do I believe that you do, either, gentlemen.

Delay is fatal. Tentative methods are not to be tolerated. The patient is entitled to the best that medical experience can offer.

What climate is to be accepted? The factors that are usually thought to be essentials are ability to lead a life out-of-doors, a pure, aseptic air, freedom from moisture, both soil and atmospheric; and it may be rarefied air.

Where are these conditions to be obtained? "I am as sure as I can be about anything at present incapable of actual demonstration," writes Sir Andrew Clark, "that recoveries from phthisis judiciously treated at high altitudes are much more numerous and much more lasting than those treated by any other method at any other place."

The very carefully collected tables of our worthy ex-President, Dr. Solly, shortly to be published, prove, beyond question, the truth of this statement.

Another of our Presidents, Dr. Knight, of Boston, whose judgment we all value, writes: "There seems to be little doubt that, in suitable cases, the improvement in nutritive activity is much more marked in mountainous regions than on the plains." Then, after citing the cases that can expect benefit from climates of high elevations, such as incipient cases, or those more advanced, but without excavations and not having any serious constitutional disturbance; the hemorrhagic and the fibroid conditions when the patient is young and the heart not enlarged; and those recovering from pleurisy and pneumonia, in whom the irruption of tubercles is feared, he goes on to say: "The region which I have found the best for this kind of treatment is the eastern slope of the Rocky Mountains, in the States of Colorado and New Mexico, where the altitude ranges from 4000 to 8000 feet."

It is needless for me to say that my own judgment corroborates that of Dr. Knight, but, then, it is *ex parte*, and, to that extent, imperfect. But, after all, the vital question is to select the very best climate for the patient, whether it be the

Adirondacks, Georgia, Colorado, New Mexico, or California, and to send him there at once. There should be no more delay in the wise selection of climate than in the early diagnosis of the disease. Having then located the patient in the spot that is deemed best adapted to his case, put him absolutely in the charge of some physician in that place in whose ability and experience you have reason to place confidence; inspire the patient to have full faith in that man and leave the case with him. From that time on, the case requires care and attention such as cannot be furnished by letter or from a distance. And it does require care. A climate, like any other therapeutic measure, has to be used discreetly to obtain the best results. That doctor who sends his patient away from home and tells him to depend on climate, and to avoid wise direction at the hands of some competent practitioner in the place to which he has gone, is grossly negligent of his patient's highest welfare.

I have ample authority to back me in this assertion: "The author will have written to little purpose," says Dr. Lindsay, "if he has not shown that climate *per se* is not the exclusive agent in the case, and that to rely upon it alone, to the exclusion of its indirect influence upon life and habit, is to invite failure."

"Wherever the patient goes, he should, if possible, "writes Dr. Knight, "consult some good physician of the region, who will lay out a plan of life. Many patients make themselves sick, and even destroy their chances of recovery, by neglecting to consult a local authority for this purpose."

"I have already alluded to the circumstances," are the words of Dr. Hermann Weber, "that intelligence on the part of the patient and his friends is a great help toward recovery in phthisis, and that want of judgment as to the nature of the illness, and of the manifold dangers, and into the means of cure, renders the diagnosis less hopeful, unless we are able to place the patient under the strictest superintendence of a judicious doctor."

In this respect doctors who should know better are extremely negligent. How commonly patients are told: "Oh, you don't

need any medical advice; go West, get a horse and lead a life in the saddle, and you will be all right." Only we, who see the dire results of such advice, know. I recall instance after instance of just such counsel, and very bad counsel it is.

One doctor tells his patient: "You don't need any doctor. After you have been West three or four weeks you might drop in and see Dr. ———, and see how your lungs are." The result is that, under the stimulus of the rare air of Colorado, the young man overdoes, comes down with high temperature, has one hemorrhage, and then a second, and Dr. ——— is called in to tell him that his lungs are in a very bad condition and that he has a fight on hand for his life.

Another doctor tells his patient: "Go West, take a shotgun and plenty of whiskey, and you will be all right," and then has the audacity to charge for what he terms his advice.

This is all wrong, thoroughly wrong. The local doctor has a great many things to determine that are of the highest importance to the patient. He has to see, for instance, that the invalid is properly located, that he has a good home and a proper room. What good is it for a young man to come to Colorado and shut himself up in the inside room of a poor hotel, as I have known case after case to do; or to take a room that the sun never enters; or to sleep in a room on the ground floor of a small cottage with no cellar underneath, and with the only window opening upon a narrow, dark, and damp passage between his house and the adjoining house? He has come West for the air; but, is he getting it? All the other conditions of life he can get, it may be in a far better degree, at home than in his new location, and then he takes particular pains *not* to get that which he came West for. This is no exaggeration. It is common, everyday experience. He is after air—pure air—and then he gets damp, impure air, all for the lack of wise direction. Selection of a proper abode is one of the things that the local doctor must consider.

The question of proper food is another matter of prime importance. The invalid must have good, nutritious food—rare meats, plenty of milk, eggs, good bread and butter, fresh vege-

tables. This is not always an easy matter to regulate. Every boarding-house does not furnish good food in abundance. The local doctor must have a wise supervision of this factor in life. He should have lived in the community long enough to know where good food and a good home are to be obtained. "Fresh air, and plenty of it; good food; rest."

The question of exercise for the invalid is a much-debated one, but it is one on which I have very positive opinions. At the start, "fresh air, without exercise," is my rule; or, if exercise is allowed, it must be very moderate. Have the patient so situated that he can sit on some piazza, where he will be sheltered from the wind, and where he can breathe in the air and bask in the sunshine by the hour. It is tedious work, I know. But, then, an invalid's life is not the perfection of existence, and I find that one soon becomes accustomed to a *quasi* monotony. It furnishes large opportunity for reading and for pleasant converse, if the patient should have one of his family or a friend along with him. A pleasant *loggia*, with a southern exposure, overlooking the plains, and the vast reach of mountain range, as enjoyed by one of my patients, suggests itself to my mind as an almost ideal location. For there one gets shelter from the wind, sunshine, plenty of fresh air, and an immense and grand view.

Gentlemen, if you have seen the bad results of overexertion, especially in the stage of early residence, that I have seen, I think that you would come to my way of thinking and would enjoin "fresh air without exercise." One must be very insistent upon this point, especially in altitudes like those of Colorado. I have seen such dire results, hemorrhages, extension of tubercular invasion, death from overexertion, that I have come to be very insistent on this point, "fresh air without exercise;" no long walks, no horseback riding, no mountain climbing, no bicycle riding, no exertion that is going to fatigue, that is going to make the heart, already laboring, beat too rapidly, or to cause the patient to get out of breath, or to make him fatigued.

Then, after a time, exercise is to be taken up in moderation,

extreme moderation; a carriage-drive, and then a longer, until the whole forenoon, and then the afternoon itself, is spent in driving; or a short walk, and then a longer, and then a longer, until the patient is doing his miles. After this, horseback, moderately at first, and always with caution. I have seen too many hemorrhages, too many reverses following undue horseback exercise, not to view it with some misgivings. In fact, one has to feel his way on the question of exercise, and to increase the amount quite gradually. This may seem unnecessary to the ordinary practitioner, and an excess of caution, but all that I can say is: "Come and see." Results justify the means.

Then, the local doctor must have more or less of a supervision of the invalid's goings and comings. He is not to keep late hours. He is not to enter much into the social life. It is not his day for wining and dining, for late card-parties, for sitting in close rooms, smoking his life away; early hours and plenty of sleep are to be enjoined. The invalid's life is to be systematic and regular. The recovery of health is not a pastime. It is a business requiring unremitting attention, constant daily care, and a stout heart. Grit on the part of the patient is a requisite. "It requireth courage bold." And this the local doctor can often evoke by the timely word, the encouraging word.

The details with reference to the proper conduct of and cure of consumption are so various, requiring such adaptation to the individual case that I cannot attempt to enumerate them. Eternal vigilance is the price of recovery. One does not jump, full-armed, into a recovery, but the process is like gaining a fortune—save the nest-egg and keep adding to it. The man who spends as he makes is not apt to get rich; no more is the invalid who uses up his surplus strength as he gains it likely to get well.

"Throw physic to the dogs" may, in some cases, be wise advice, but it is likely to be very unwise.

I am no advocate of injudicious and wholesale médication. I have seen great harm come from it. I often wonder how the

patient is able to get in all the doses that I have known to be ordered for him in one day. But it is nonsense, arrant nonsense, to condemn all medication because of these abuses. If one is able to increase the appetite; to improve the digestion; to regulate the bowels; to stop the night-sweats; to lessen the cough, without interfering with important functions; to loosen the expectoration; to increase the weight; to help elimination, etc., it would be foolish for him not to attempt to give this assistance, because, forsooth, the results are to be obtained through the agency of drugs. Herein will lie, to a very considerable extent, the skill of the local doctor; and in the wise direction of his patient, and the judicious exhibition of remedies, he will be able to second the efforts of nature and the efficacy of climate in the repair of destruction caused by disease.

The remarks that I have offered may seem trite and exceedingly commonplace. They are everyday observations and contain nothing new or startling; but I see them so often disregarded. I find, almost daily, a violation of general principles so flagrant, that I feel harm cannot come from calling them again to the attention of this Association, and through it to the attention of the medical profession at large.

In the medical world, as in the world at large, the admonition holds good:

> "The friends thou hast, and their adoption tried,
> Grapple them to thy soul with hooks of steel;
> But dull not thy palm with entertainment
> Of each new-hatched, unfledged comrade."

THE TREATMENT OF CERVICAL TUBERCULOUS ADENITIS.

By E. FLETCHER INGALS, A.M., M.D.,
CHICAGO.

Before the days of antiseptic surgery the treatment of enlarged lymphatic glands was left largely to the physician until suppuration occurred, and then they were allowed to rupture spontaneously or opened by a large incision, and were healed after a long period of suppuration, or were removed by the surgeon's knife; but within the last few years the comparative impunity with which operations may be made has led to a hasty resort to the knife in these as well as in many other cases, a practice which I am glad to believe is now falling into disrepute with the best surgeons. About a century ago chloride of calcium was recommended for the reduction of enlarged cervical glands, and was often given with the most gratifying results. Various other remedies were similarly employed with more or less benefit, the most important of these being iodine or some of its preparations. Under a course of treatment with one of these alteratives in a large percentage of cases the enlarged gland slowly disappeared. In less fortunate cases where the remedies were not employed soon enough, or where, for some reason, they did not produce a satisfactory result, the disease progressed for months or years, usually being attended by the suppuration of gland after gland with prolonged discharge. In many such cases the suppurating cavities finally healed, leaving the person badly scarred, but otherwise little, if any, the worse for this delayed termination, and in others, although the enlarged glands disappeared and the suppurating cavities healed, the patient remained in poor health the re-

mainder of his days; again, with some few, though in a much smaller percentage than generally supposed, pulmonary tuberculosis develops and with its progress and usual termination the history of the case is closed.

While there seems to me no doubt that some cases of cervivical adenitis should be operated upon promptly, I feel very confident that there are many others that do better under medical treatment. I am glad to find that Nicholas Senn, who enjoys the highest reputation for skill, good judgment, and conservatism, does not favor promiscuous removal of these growths, but, where the glands are small and where the constitutional symptoms are not pronounced, recommends, first, a thorough trial of guaiacol internally, which treatment he tells me effects a cure in many instances.

It was formerly my practice to treat cases, in which the glands were not greatly enlarged, with iodides or chloride of calcium, but latterly I have used guaiacol or the carbonate of creosote, and injected these glands, from time to time, with a solution of carbolic acid of from 2 to 5 per cent. strength. Severe cases I have referred to a surgeon. During an experience of twenty-five years I have seen my fair proportion of good and poor results in these patients when treated by medical means, and in those cases that seemed entirely refractory to such measures. I have seen a number of cases of suppuration in enlarged cervical lymphatic glands, and have tried various methods of treating the cavity before opening it, such as the repeated injections of solutions of carbolic acid and emulsion of iodoform, but do not at present recollect any case, excepting the one I now report, in which a successful cure of the suppurating cavity was made without resort to free opening. In the present case a few injections resulted in complete cure, and I am led to believe that similar treatment might be effectual in most cases of the kind, also that similar treatment will enable us to reduce non-suppurating glands much more rapidly than medicinal treatment alone, and will in many cases obviate the necessity of using the knife. This does not seem too much to expect of an agent that can speedily stop the sup-

puration in a presumably tubercular abscess or cause steady diminution in the size of even a malignant tumor.

The case is that of H. E. V., a man thirty-three years of age, a clerk by occupation, who came to me first on the 14th of October, 1895, with the following history: Three years previously he had had a free hæmoptysis, which was followed six months later by another. Two other hemorrhages had occurred six and two months before he visited me, and finally a free hemorrhage one week before I first saw him. At that time he was troubled with cough and suffered from pain in the left lung. His appetite and strength were fair, but he had lost flesh, was having diurnal fever, and presented all the symptoms of a person with pulmonary tuberculosis. He stated that he had used alcoholic stimulants to excess until within a week, and also that he had lost a brother from consumption. A physical examination revealed dulness at the apex of the left lung as low as the first rib, with broncho-vesicular respiration and occasional subcrepitant râles. I prescribed the third of a grain of the extract of nux vomica as a stomachic tonic, half a grain of the extract of hyoscyamus to relieve the cough, and five grains of the carbonate of guaiacol for its supposed specific effects upon the tubercular process in the lung; these to be taken four times daily. I at the same time ordered after each meal drachm doses of maltine with the hypophosphites, which dose was rapidly increased to half an ounce and combined with fifteen grains of the chloride of calcium. At the next visit, nine days later, as the cough continued much the same, the extract of hyoscyamus was increased to two-thirds of a grain, and, on account of the apparent decrease in his appetite, the carbonate of guaiacol was reduced to three grains. He was given at the same time two grains of the muriate of berberine, the extract of nux vomica and other remedies being continued as before. Two weeks later it is noted that he weighed one hundred and forty pounds and was somewhat improved.

Two weeks after this his pulse was found to be 120, but he had gained a pound and a half in weight. The same general course of treatment was continued, and on the 4th of December

he was doing very well, the pulse being only 106. At this time there was a swollen cervical gland on the right side of the neck as large as a hen's egg. On December 19th he reported himself as very well, pulse was only 100, and he had gained about five pounds in weight, but the swollen gland had suppurated. Owing to frequent satisfactory results which I had obtained from injections of lactic acid into tumors both benign and malignant, and to the good results which had sometimes attended its application in tuberculous ulceration, I at this time decided to inject lactic acid into the abscess cavity. With an exploring syringe I withdrew a quantity of pus, amounting to about two drachms, and without removal of the needle injected a similar amount of sterilized water containing 3 per cent. of carbolic acid and 20 per cent. of lactic acid. This was allowed to remain a few minutes and then withdrawn. The internal treatment was continued as before. I did not see the patient again for three weeks, but at that time the swelling of the right side of the neck was considerably smaller and much less painful, though it still contained fluid. Upon aspirating the cavity again I was gratified to find that instead of pus it contained only about half a drachm of thick greenish serum, with a few white flakes, which may have been purulent in character. At this time I injected half a drachm of a solution containing 3 per cent. of carbolic acid and 25 per cent. of lactic acid, and left it in, sealing the puncture with collodion. The home treatment was continued. Two weeks later, when the patient next reported, the swelling upon the neck was found larger than at the last visit, and he stated that he had suffered considerable pain for several days after the injection. His general health, however, remained good, and he had gained another pound in weight. At this time I withdrew about a drachm of serum, containing about 10 per cent. of pus. The cavity was again injected with a 6 per cent. solution of carbolic acid and 30 per cent. of lactic acid in water with a little glycerin. This solution was allowed to remain a a few minutes and then withdrawn. I did not see the patient again for about a month. I then withdrew a little less than

a drachm of clear serum, containing no pus, and injected forty minims of a 40 per cent. solution of lactic acid with about 5 per cent. of carbolic acid. This was allowed to remain a few minutes and then withdrawn. At this time, as there seemed no further need for anodynes, the capsules containing the nux vomica and hyoscyamus, etc., were discontinued, and the patient was given carbonate of creosote in doses of ten minims the first day, eleven minims the second day, and so on until the amount should reach a drachm taken three times daily, after eating. The malt with hypophosphites was continued. He did not report again until a month later, the 26th of March; then he stated that there had been a good deal of swelling and pain in the neck after the last injection. I found that the abscess-cavity had completely healed and the remnants of the swollen gland about it had nearly disappeared. The patient was feeling very well, had no cough, and seemed in a fair way to recovery. At this time he was taking the carbonate of creosote in doses of thirty-eight drops three times daily. I have used a solution of lactic acid several times as a parenchymatous injection into tumors, some of which I felt certain were malignant, and I have nearly always had the satisfaction of seeing the growth gradually diminish in size. It has been my custom to begin with weak solutions of not more than 15 or 20 per cent. strength, and gradually increase to 35 or 40 per cent. strength. I have gone beyond this several times, but 45 or 50 per cent. will usually produce a slough. I have found that even a 15 per cent. solution of the lactic acid alone generally causes considerable suffering, but when combined with from 2 to 5 per cent. of carbolic acid it causes but little pain. In some cases I have injected a 4 per cent. solution of cocaine about three minutes before the lactic acid was employed. By so doing the immediate pain otherwise caused by the lactic acid has been prevented, and the combination of lactic with carbolic acid has prevented subsequent suffering of any considerable degree. I usually inject from twenty to thirty minims of the solution at one treatment, and do not repeat it for a week or more. One case proves

nothing at all, but my experience with lactic acid in this and other cases has been so favorable that I wish to urge you to try it. I make no claims to originality in the use of this agent, but I hope that this brief sketch may interest you and be of benefit to your patients.

DISCUSSION.

Dr. Munro: In treating this class of cases it is a safe rule to exclude syphilis, as it is often difficult to distinguish, from gross appearances, between glands enlarged through tubercular infection and those due to syphilis. Furthermore, extensive cervical adenitis, especially in children, may be due to some peripheral irritation, such as a dirty scalp, an eczema of the scalp due to pediculi, abscess of the middle ear, or dental caries. Children with adenoids frequently present themselves with large glandular masses, which disappear more or less completely after removal of the pharyngeal obstruction. In all of these cases, of course, a tubercular process is often engrafted upon what was in the beginning a mild septic adenitis. Dr. Ingals's paper is of great interest, and I shall make a point of trying his method. Any form of treatment like this that will do away with the long and often ragged scars must command our most hearty commendation.

Dr. Ambler: If I may be permitted as a visitor, I would like to report a case of this disease recently treated by Prof. Klebs's antiphthisin. The case was that of a female, aged twenty-seven years, examined on the first of last July. At this examination thirty-seven distinctly enlarged glands were found in the cervical and clavicular regions, ranging in size from a walnut down to a pea, a number being quite painful under manipulation.

A short percussion note and hard respiration were observed in both apices. Klebs's antiphthisin was used hypodermatically in doses from 0.1 c.c. to 1.0 c.c. for a period of two months. A few of the glands were injected directly, and one of them breaking down upon being opened discharged a bloody pus, which, being microscopically examined, showed tubercle bacilli, confirming the diagnosis.

The neck measurement decreased from $15\frac{1}{2}$ to $12\frac{3}{4}$ inches, and all but seven of the glands disappeared. These seven being cheesy, no diminution in size was expected or accomplished. The temperature, pulse, and weight became normal and the pulmonary symptoms disappeared. The case was reported at length in the *New York Medical Record*, February 8, 1896.

Dr. E. O. Otis then showed a self-retaining drainage-canula, de-

vised by Dr. F. M. Briggs, of Boston,[1] for preventing scar in cervical abscess, which he had used with satisfactory results.

It consists of two surfaces of silver, curved laterally, bent outward, and joined at the angle. The cut through the skin being made (one-eighth of an inch), the knife is pushed into the abscess. Upon its withdrawal the canula is inserted, as in Fig. 1. When the joint is

Fig. 1.

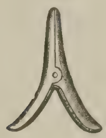

Fig. 2.

reached the external arms are closed. This reverses it. The internal arms open, dilating the tissues in the vicinity of the cut and retaining the canula within the cavity, while the external arms come together and make a tube (Fig. 2). A projection at the end of each external arm prevents it from falling into the abscess cavity, and it is fixed *in situ*. It is removed by seizing one of the external arms and withdrawing it until the hinge is reached, when, by spreading, it is again as in Fig. 1, and easily slides out.

The canula can be cleaned and sterilized, and gives free, continuous, and, if necessary, permanent drainage through a skin cut barely one-eighth of an inch. It reduces the cut to an undoubted minimum, gives surgical drainage, and leaves the least possible resultant scar.

In conclusion. where the case is a multiple, partially broken-down, glandular inflammation, the patient should understand clearly at the outset that the treatment may extend over a period of many weeks, and that a radical operation may be the final outcome.

Dr. W. D. Robinson: Ichthyol applied under a covering of lamb's wool I have found markedly efficacious.

Creosote in the form of carbonate I have given in large doses for prolonged periods, but with little result beyond apparently checking progress of a progressive enlargement.

That the best results are obtained in localities where there is an excess of sunshine has always been my experience. For years it has been my custom to place prison convicts in the most constant and copious direct sunlight obtainable in the open yards, and with unquestionable benefit. Dr. Reed has written a paper on some observations on effects of intensity of sunlight, and I should like to know his observations on this point.

[1] Boston Medical and Surgical Journal, May 2, 1895. Leach & Greene, Boston, makers.

MOUNT POCONO, PENNSYLVANIA, AS A HEALTH RESORT.

By L. D. JUDD, M.D.,
PHILADELPHIA.

It is true, as our former worthy President, Dr. Solly, remarked in his address on "The Principles of Medical Climatology," that the medical profession as a whole are "lamentably ignorant in their climatology and sadly careless and ignorant in their application." As physicians it is our duty to know, so far as possible, the characteristics of highland and lowland, seashore and mountain, and their effect in health and in disease. It includes the consideration of air and water, trees and plants, soil and drainage. Good advice is good medicine, and he who makes himself familiar with the wonderful resources of his own country adds to his stature in practice, and enables himself to intelligently direct the sufferer to a locality suitable to his condition whereby health may be more rapidly restored, or longer life and greater comfort given.

It is important that we of the eastern portion of this Continent particularly should know something of the climate and climatology of our near-by mountain country, or of localities that should be known as health resorts. Very few health-seekers can afford the strength, time, or money for a trip to the table-lands of the Rocky Mountains in Colorado, New Mexico, and California. It seems to be comparatively unknown by the profession at large that we have here in the East, easily accessible, a region whose sanitary qualities are second only to those of Colorado, the so-called Switzerland of America.

In this paper I desire to direct attention to the region of the

Pocono Mountains, situated in Monroe County, Pa., particularly to that section known to geologists as the Pocono Plateau. The Pocono Mountains constitute a group extending northeast and southwest a distance of thirty miles or more, and presenting an elevated plateau about ten miles in width. The altitude in the neighborhood of Mount Pocono Station is about 1800 to 2000 feet. It is only three and a half hours by rail from New York City and four and a half hours from Philadelphia. At the Delaware Water Gap, where the railroad is about 320 feet above tidewater, you pass through the range of Blue Mountains over a picturesque route. The road at this place leaves the Delaware River to the right. After passing Stroudsburg, the county town of Monroe County, you reach Spragueville, a few miles further on; from this point the road begins to ascend the foot hills of the Pocono Mountains, the rise in the next 15 miles being 1500 feet; this brings you to the top of the eastern declivity of the Pocono Mountains, where is located the railway station. From this point of vantage the whole of the immense valley between the Blue Mountain-range and the Pocono Mountain-range, filled with hill and mountain spurs, lies at your feet. The view shows mostly a wild and wooded country with here and there patches under cultivation, dotted with small settlements far between. To the right are seen eight or ten mountains, near and far; to the left the Pocono Mountains stretching toward Port Jervis; in front of you the Blue Mountains, and in the far distance, through the Delaware Water Gap, are seen the Musconetong Mountains of New Jersey. The view is a perfect realization of mountain scenery. While the forests of Pocono have been devastated in many sections, there are still standing in the Naomi section large tracts of hemlock, spruce, balsam, white and yellow pine. In the immediate vicinity of the Wiscasset and the Pocono Mountain House the trees are mostly pine and spruce, white, red, and pin oak, chestnut, hickory, poplar, maple, and birch. The smaller growth is very thick, including huckelberry, brakes, sweetfern, scrub oak, laurel, and rhododendrons, which abound in profusion.

Geologists declare that this section is as interesting in a geological point of view as it is uninteresting mineralogically. Throughout this romantic district there is rich and abundant material for scientific research, and to the eye of the scholar, if not to that of the capitalist, the rocks of Monroe County must be of profound interest, for here nature has stamped in indelible lines the record of pre-historic operations. The evidences of glacial action are plentiful everywhere.

"The highest peaks of the Pocono Mountains are capped with Mount Pleasant conglomerate in massive grayish-white cliffs. Next in order come the red rocks of the Catskill series, the Mount Pleasant red slate, members of which form the surface over most of the Pocono Plateau. Below this comes a thin stratum (of uncertain thickness, because always partially concealed under drift) of green sandstones and slates, estimated by Professor White at 200 feet in thickness." The soil is, therefore, light, stony, and absorbent. Taking this into consideration, together with the topography of this section and the consequent free-drainage systems, the deduction may readily be made that dampness of any duration is an impossibility. It is a noticeable fact that in an hour or two after a heavy rainfall the ground, roads, and walks are comparatively dry and in an enjoyable condition. Here we have soil and drainage, par excellence. Too little attention is paid to the soil as a prime factor in the selection of a health resort. I cannot do better than to quote Dr. Solly on this point: "It is not only the material of which the soil is composed that must be considered, but also its natural drainage and the disposition of its watershed. The importance of this consideration, which we all present admit, perhaps we do not sufficiently dwell upon to our clients and our colleagues; often do we find a town in a health-giving air with good surrounding soils, yet situated in a river bottom, recommended for invalids; or a flourishing health resort under benignant skies, built upon a clay-bed, or in a basin which cannot drain."

As we should naturally look to the character of the soil upon which to build a house, so, too, should we make ourselves ac-

quainted with the soil and the drainage of the locality we select for ourselves or others as a temporary residence for health or recreation.

The climate on this plateau is decidedly tonic, the atmosphere being wonderfully dry and pure the whole year round. It is safe to say that the thermometer registers on an average of from ten to fifteen degrees lower here than in the cities of New York and Philadelphia. Some days in July and August it is hot in the sun, but in the shade the breeze, that always abounds, makes it most comfortable. The nights are cool, the air soft and balmy. There are no mosquitoes. I am informed that the climate here is almost a specific for malarial diseases; being top-mountain air, it is free from all impurities. I subjoin a report of Thomas Shaw, M.E., who has made an analysis of the air captured on the section owned by Ellwood Bonsall, in which he says: "I doubt if it is possible to find air in any part of the globe more free from impurities than the air of the Pocono Mountain." (See Appendix "A.")

The water is of the purest quality. Minerals being scarce in this region the water naturally carries a minimum quantity of these substances, and this I claim is an important factor to consider; for while in some special conditions springs rich in mineral substances may be and often are of the greatest benefit, yet in others they may be and often are extremely harmful. The kind of diseases here benefited on the whole are of that character where purity of water, comparatively free from mineral and organic substances, is of the highest value.

I subjoin a report (see Appendix "B") founded on analysis made of the water from a spring on the estate of Ellwood Bonsall, situated midway between the Wiscasset and the Pocono Mountain House. An analysis also of water taken from the springs on this ridge owned by Howard A. Chase and E. E. Hooker each exhibit a similar purity.

There are a great variety of drives around the country, the roads being fair, and improving. The walks are romantic, especially during the season when the laurel and rhododendrons are in bloom. Amusements during the season are not

wanting, there being several hotels within a radius of five miles. I look forward to the time when large sanitariums for pulmonary troubles will be erected here, open throughout the entire year. It has of late been demonstrated, through observations made in the sanitarium at Falkenstein, Germany, that consumptives should enjoy fresh, healthful air, without regard to the weather. Experience has demonstrated to my entire satisfaction the value of this climate and altitude in the winter months, also on both fibrinous and tubercular phthisis; therefore I do not hesitate to indorse the fact that patients of this class may be perfectly healed in northern climes, and the old idea that they can be successfully treated only in southern climes must be abandoned.

I can from observation and experience recommend this region to those suffering from debility due to overwork or overworry, and nervous cases generally. The altitude is not so great as to increase nervous conditions, as we know to be the case in the higher altitudes, especially with the female sex, although it has occurred to me that their mode of dress—the compression of the chest-walls, and the crowding down of the pelvic viscera by the all-prevailing corset—is in a greater degree to be held responsible than the effect of altitude upon the nervous system. Here all throat and chest troubles are benefited, and weak lungs are made stronger. To hay-fever and asthmatic subjects this locality is a blessing. I have noticed marked increase of vigor in the old as well as the young. In short, I believe this Pocono region to be second to no other eastern locality for all the requirements of a typical health resort.

This, I believe, gentlemen, furnishes as accurate an account of the physical conditions of this mountain region as I can command. Personal experience and long observation from residence not only here, but also in the mountains of Colorado, where I lived for nearly four years, should enable me to judge of the benefit to be derived by the health-seeker in such a country as this I have described. In sending patients to the mountains we should consider not alone the altitude, but quite as

much the specific conditions of soil, trees, air, and water. In addition to this should arise the question of environment; too often this is overlooked. The sick physically are sick mentally, and when there is no variety of scenery for the eye to dwell upon, and only limited, and, perhaps, crowded walks and drives to enjoy, no amusements, and, perhaps, poor dietary, all the other requisites of climato-therapy are of no avail, and the patients return to their homes unimproved, a reproach to the locality as well as to our medical discernment.

APPENDIX "A," No. 1. AIR TEST.

915 RIDGE AVENUE, PHILADELPHIA, August 4, 1892.

FRIEND BONSALL: In reply to your favor of the 3d instant, I will send the application to-morrow with directions how to capture air for the purpose of analysis on a special instrument that I have devised.

I have provided an instrument possessing the highest degree of accuracy which performs work that has heretofore seemed an impossibility, and the personal equation of test is reduced to the $\frac{2}{1000000}$ part.

The French and German authorities have heretofore estimated the pure air of the mountains and ocean to carry $\frac{4}{10}$ of a cubic foot of CO_2 (carbonic acid gas) in 1000 feet of air, and that $\frac{6}{10}$ of a foot is the permissible amount for health. You will observe that the fraction of this gas present in the air is so small that it requires the highest skill in chemistry to make a proper determination of the same. I, therefore, conclude to put the instrument I devised to make determinations of this extremely delicate test, and I find in actual practice that the presence of the $\frac{1}{200}$ of 1 per cent. of CO_2 in the air can be measured as correctly as an ounce weight on a druggist's scale. Any person of ordinary intelligence can be instructed in two hours' time to make this test.

In view of the great accuracy of this instrument (heretofore impossible with any instrument before known), I believe that properly appointed authorities in scientific institutions will review the tests of air heretofore made and reported upon.

Please accept my thanks for your invitation to visit Pocono Mountains, but I cannot see my way clear at this time.

Very truly yours,

THOS. SHAW, M.E.

Appendix "A." No. 2.

915 Ridge Avenue, Philadelphia, August 10, 1892.

Dear Mr. Bonsall: In reply to favor of the 8th instant, I had the air you sent from Pocono Mountain tested yesterday. I doubt if it is possible to find air in any part of the globe that is more free from impurities than the air of Pocono Mountain. Carbonic acid gas is found in the infantile fraction of the $\frac{1}{1000}$ part of 1 per cent., equaling 1 foot in 100,000 feet; this you will see is the $\frac{1}{100}$ part of 1 foot in 1000 feet.

The air of the city of Philadelphia, taken at an elevation of 35 feet above the street at my office, carries from $\frac{10}{100}$ to $\frac{13}{100}$ of a foot in 1000 feet, whilst the air at Shawmont, 9 miles northwest of the City Hall, 200 feet above tide-water, carries $\frac{7}{100}$ of a foot in 1000 feet, and the permissible amount for health is rated at $\frac{6}{10}$ of a foot in 1000 feet.

I recently tested the air of one of our music halls, capacity of the house about 1200, house one-third full and seated two hours before taking air from the upper gallery, and found the carbonic acid gas present was sixteenfold greater than the air outside of the theatre, and about as bad as the air found in many of the mines.

Very truly yours,

Thomas Shaw, M.E.

Appendix "B." Water Analysis.

201 South Fifth Street, Philadelphia, October 27, 1896.

Mr. W. S. Kaiser, 122 North Ninth Street, Philadelphia, Pa.

Dear Sir: The following are the results of analysis of the sample of mineral water from Mount Pocono, Pa., received from you on the 9th inst.:

	Parts in one million.	Gr. in one U. S. standard gal.
Sulphate of potash	0.63	0.037
Sulphate of soda	0.82	0.048
Chloride of sodium	0 97	0.057
Nitrate of soda	0.09	0.005
Carbonate of lime	7.71	0.449
Carbonate of soda	2.56	0.149
Alumina and oxide of iron	0.51	0.029
Carbonate of magnesia	3.65	0.213
Silica	5.93	0.346
Organic and volatile matter	6.80	0.397
	29.67	1.730
Total solids by evaporation	29.50	1.729

Very respectfully,

Reuben Haines.

The water within examined was taken from a large sand spring on grounds of Ellwood Bonsall. The spring flows about 4 inches of

water, and is wholly unprotected from drainage, it being near the base and on the mountain-side. The water examined was taken by putting a 50-foot length of rubber garden hose in the spring and letting it flow through it into a 5-gallon demijohn. Temperature of water at spring about 50 degrees. Temperature in valley was about 70 degrees, on mountain-top, about 325 feet above, 60 degrees.

ELLWOOD BONSALL.

DISCUSSION.

DR. EUGENE P. BERNARDY : Knowing thoroughly the region of Mt. Pocono, I fully agree with Dr. Judd in regard to its pure and exhilarating atmosphere. For patients convalescent from severe illness, where continued weakness necessitates change; for the pneumonia cases, where resolution is slow in taking place; for cases of persistent cough, without recognizable changes, a visit of several weeks to Mount Pocono is usually followed by good and permanent results.

In cases of phthisis, I have not met with the success of Dr. Judd. While the incipient and early forms of phthisis seem to be somewhat benefited, the hemorrhagic form of phthisis did not seem to do well.

There is no doubt that in the early forms of phthisis a sojourn in this region will be of great benefit.

The snow in winter is dry; the atmosphere in the fall and winter is cold, dry, and exhilarating.

DR. CURTIN : I corroborate fully the remarks of Dr. Judd in reference to this region.

DR. S. A. FISK : Those of us who practice in the West need to know more of the valuable resorts in the East, for we are compelled at times to send patients away from our mountains to more moderate altitudes in the Eastern States.

THE CLIMATE OF ARIZONA.

By MARK A. RODGERS, M.D.,
TUCSON, ARIZONA.

"THERE is probably no country on the globe that shows so many striking and picturesque topographical contrasts as does Arizona. Frightful chasms, dark and gloomy cañons, massive mountains, rolling plains, rich and fertile valleys, arid wastes, and beautiful mountain vales form a panorama of nature at once in her wildest and most gentle mood. Here time has wrought mighty changes, and the face of the land yet bears the traces of the fearful convulsions which rent it from end to end. From Utah to Sonora, and from the great Colorado to New Mexico, the same physical features are met with. Mountain and valley, table-land and plain, barren peak and rocky gorge, and above all a sky without a cloud and a sun unequalled for brilliancy. Such a land is Arizona; a land blessed with many a gift, and showing a wild and attractive beauty that well becomes a clime that has given birth to a race wilder than its cañons and mountains, and with natures as fiery as its summer suns."[1]

In order to understand the nature of the climatic conditions found in Arizona, and to study the climate intelligently, it will be necessary to first glance at the geographical location, its area and topography.

Arizona is situated between 31° and 37° north latitude and between 109° and 114°.40′ west longitude. It is bounded on the north by Utah and Nevada, on the east by New Mexico, on the south by the Mexican State of Sonora, and on the west

[1] "The Resources of Arizona," 1884. Patrick Hamilton.

by California and Nevada. Its area, according to the latest surveys, is 113,916 square miles. Its length from north to south is over 400 miles, and from east to west more than 350 miles. It is larger than the combined areas of New England, New York, and New Jersey. Its altitude varies from below the level of the sea to thirteen thousand feet above sea-level.

The conditions which confront the student when he begins to study the climate of Arizona are so unlike those which obtain in the Mississippi valley and the Atlantic and Gulf States that he is compelled to look for some general cause for the radical difference.

On the Atlantic coast, from the Gulf of St. Lawrence to Alabama, the Appalachian Mountain system extends, having throughout its course a general northeast to southwest trend. Generally speaking, this range, which corresponds to the Corderilleran mountain system of the Pacific coast, has a moderate altitude, rarely more than 5000 feet; the ranges and spurs all have a uniform and parallel direction, and the ascent is gradual. From the seacoast on the east, and from the plains on the west, there appear, in the order named, a gently undulating rolling country, then hills of moderate altitude, and these coalescing form, with a gradual general elevation of the entire mass, the mountains proper. There are no enormous cañons like those of the Colorado and Columbia, and the elevations extend over large areas of country.

The Atlantic coast is influenced by no equatorial ocean current. Hence it is that New York, which is about the same latitude as Naples and Madrid, has a climate much like that of Northern Scotland or Scandinavia, which localities are about the same latitude as Northern Labrador. An altitude of 5000 feet does not deplete the wind currents of their moisture, so that the valleys which are located between the mountain ranges are everywhere well watered, both from the Atlantic Ocean and from the Great Lakes. There is, therefore, no region of the Atlantic seaboard which is deficient in moisture, and there is on the contrary a marked humidity. All this vast territory, including not only the Atlantic coast, but also

the Mississippi valley, where the conditions are virtually the same, is subject to great alterations in temperature, great heat in summer and excessive cold in winter being the marked characteristics, with sudden changes in temperature and markedly humid atmosphere, in which the *sensible* extremes are felt with a discomfort which is unknown in the arid regions.

On the Pacific coast the conditions are entirely different. Here, too, a gigantic mountain system ranges between the Mississippi valley and the ocean. Like the corresponding system on the Atlantic coast, its general trend is toward a central axis, the direction, however, being from northwest to southeast. Generally speaking, this range has a high altitude, frequently more than 5000 feet, and as high as 15,000 feet in every State and Territory. The ranges and spurs do not have a uniform and parallel direction, but are cut up in every direction, making in reality a series of mountain ranges of independent trend. Finally, the ascent is always abrupt, and, from the soft nature of the elements composing the mountains, the streams have cut their way far below the level of the surface; hence the gigantic cañons.

The Japan Ocean current also has an important influence on the climatic conditions of the Pacific coast. This stream, arising in the equatorial regions, flows north along the eastern shore of Asia until it strikes the shores of Northern Siberia and Alaska, where, after being tempered by the cold waters from the Arctic regions which come down through Behring Strait, it flows southward along the western shore of North America as far as the equatorial regions. The stream has a most decided effect on the temperature of the entire Pacific coast, and also influences the trade winds and the rainfall. The large body of water which comprises the Japan current being always at the same temperature, it follows that the atmosphere of the entire coast region remains, with little variation, the same throughout the entire year. So that while the people of the north and east are enduring the most intense cold or the most oppressive heat, the people of the Pacific coast are enjoying a temperature which is most equable and

moderate. While the effect of the Japan current is felt over the entire western coast of North America in a general way, principally from a moderation and equability of temperature, still, from this peculiar topography of the country, the modifications of temperature, humidity and rainfall are very marked. Thus, for example, Washington, Oregon, and Northern California, west of the mountains, are excessively humid and equable; whilst east of the mountains the rainfall and humidity are deficient and the temperature almost entirely dependent upon altitude and latitude.

In addition to the Japan current, another large stream of warm water makes its influence felt along the Pacific coast. This is the north equatorial drift current. Arising in the north equatorial region this stream flows westward, along the Tropic of Cancer until it strikes the Japan current as it flows northward along the eastern shore of Asia. By this current it is turned north as far as the island of Nippon, Japan, by which it is deflected east. It then flows almost due east, between the fortieth and fiftieth parallels of latitude to the western shore of North America, where, meeting the Japan current on its return from the Arctic regions it is deflected south. It now follows the Japan current southward as far as the thirtieth degree of latitude, when, meeting the equatorial counter current from the southwest, it is deflected westward, from whence, flowing over the Hawaiian Islands, it arrives at its original starting point. The water of this stream, after flowing for upward of four thousand miles through the equatorial region, emerges therefrom to flow through the temperate region. From the length of time which is required for this stream to pass through the tropics it is apparent that the water must be warm. In passing through the temperate region it never reaches higher than the forty-fifth degree of latitude, and even then the waters and atmosphere surrounding it are tempered by the Japan current. It follows, therefore, that this stream is always exceedingly warm, and the winds which arise and blow over it are always bland. The effect of this is felt all over the Pacific coast and even beyond the Rockies, where,

as far inland as the Dakotas, the fierce blasts of midwinter are occasionally replaced by a balmy spring-like wind—the "Chinook"—which causes the great drifts of snow to vanish within a few hours.

At the southern borders of British Columbia and Alberta, the great Corderilleran mountain system divides into two immense chains: the Rocky and Sierra Nevada. The former extends through Montana, Idaho, Wyoming, Colorado, and New Mexico, while the latter passing near the coast, traverses Washington, Oregon, and California and ends by forming the peninsula of Lower California. These vast mountain ranges form, almost without a break, two gigantic walls five thousand feet and over in height. The territory between these stupendous barriers comprises besides Utah, Nevada, and Arizona, the eastern portions of Washington, and Oregon, and the western portions of Idaho, Wyoming, Colorado, and New Mexico. The entire region within these limits is an arid waste, except where the altitude rises to above five thousand feet; for the moist laden winds from the Pacific find the Sierra Nevadas an insuperable obstacle to their progress, and what little moisture reaches the eastern slope of the Rockies is entirely condensed before the winds can cross the summits. The moisture for this immense region is either derived from such bodies of water as the Great Salt Lake and the Gulf of Lower California, or gains entrance through an occasional mountain pass, and this meagre amount of moisture is so rare that it will only condense on the higher altitudes.

Arizona lies at the southern extremity of this great basin. It is situated far inland and has a southwestern exposure. In viewing the topography of the country as a whole, we find the highest point of elevation at the northeastern portion of the territory, in the San Francisco Mountains, the highest peak of which, Mount Humboldt, raises its snow-clad summit to a height of thirteen thousand feet. From thence there is a general depression in a southwesterly direction as far as the basin of the Colorado desert, which is below sea-level. Probably no country in the world presents such great diversity of

altitudes within such limited areas. One may stand on the brink of the Grand Cañon of the Colorado and within a few hours make a sheer descent of a mile and a half to the banks of the stream.

The contour of the country is peculiar. It has been likened to a washboard. With the southeastern extremity so tilted as to represent the highest altitude of Mount Humboldt, and the southwestern extremity so as to represent the depression below sea-level in the Colorado desert, the corrugations running from northwest to southeast, but with many breaks in the continuity of the ranges, one obtains a rough conception of the topography. Although the ranges have a general trend from northwest to southeast, the drainage, owing to the confused and broken contour, is entirely to the southwest; and the rivers which drain this vast area, in order to gain access to the sea, have cut great cañons and gorges through the soft elements which compose the mountains.

Everywhere throughout the Territory, plains and mountains alternate; the latter rising abruptly from at or near sea-level to a height of several thousand feet. One may stand on the mesa at Tucson, at an elevation of twenty-four hundred feet and see a distance of one hundred miles. Within that vast scope no less than six separate mountain chains are in plain view, seemingly but a few leagues distant, which range in altitude from four thousand to eleven thousand feet. These mountains, above an altitude of four thousand feet, are covered with great forests of pine and fir; while the intervening mesas are nothing but arid wastes.

This peculiar topography has a decided bearing on the climate of Arizona. So frequent are the mountain ranges that their summits represent, so far as the wind currents are concerned, the general level of the country. Hence it is that the moist laden winds pass over the intervening valleys and condense on the tops and sides of the mountains; the rainfall being directly proportionate to the altitude.

TABLE I.

Showing the relation between rainfall and altitude.

Stations.	Altitude. (Feet.)	Rainfall. (Inches.)
Camp Colorado	0	2.05
Yuma	141	3.05
Gila Bend	735	6.15
Phœnix	1068	7.08
Tucson[1]	2400	11.00
Fort Huachuca	4785	15.33
U. S. Station, Chiricahua Mountains	7400	22.33

A study of the temperature records for Arizona shows that the entire Territory is influenced by the conditions which affect the other portions of the Pacific coast, although only to a slight degree. Thus, the temperature of Tucson is milder than the temperature of Atlanta, although the latter city is more than 1000 feet lower than the former; and the temperature of Yuma is milder than that of New Orleans, notwithstanding the fact that the latter is more than 200 miles nearer the equator than the former.[2] Aside from these general conditions, which make all regions of the Pacific coast warmer than corresponding latitudes on the Atlantic and Gulf coasts, the temperature of Arizona is largely dependent on altitude.

I repeat, the temperature of Arizona is slightly warmer than corresponding altitudes and latitudes on the Atlantic coast or in the Mississippi valley. Further than this, the temperature seems only to be modified by altitude and humidity. We have no records of temperature at a higher point than Prescott; but we know that the temperature is lower as we ascend. At Flagstaff we encounter several feet of snow with zero weather, and the summit of Mount Humboldt, far above the line of vegetation, is almost perpetually covered with snow.

It is astonishing how few physicians in the East are familiar with the climatic conditions of the arid West. For example, hundreds of invalids come to Arizona every year who have been recommended by their physicians to go Arizona or New

[1] Rainfall for Tucson in 1891, 6.61 inches, of which 2.08 inches fell in February, and 2.26 inches fell in August.

[2] Mean annual temperature of New Orleans, 68.6°; of Yuma, 71.4°. Report of the Chief of the Weather Bureau for 1891.

Mexico. They might almost as intelligently be instructed to go to the equator or to the North Pole. The patients usually go first to New Mexico, where they find all the towns where accommodations can be had at an extremely high altitude. A high altitude in winter means cold weather. They are compelled to remain indoors, and after suffering intensely from the cold, for the accommodations are usually poor, they finally decide to try a warmer climate, which they cannot find in the United States, at a high altitude.

TABLE II.

Showing the difference between the temperature of Tucson and various points on the Atlantic coast, Mississippi valley, Great Lakes, and Gulf of Mexico. Table for nine months, October to June inclusive, 1891-92.

Stations.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	Mean average.
Philadelphia,	59.9	44.2	42.8	31.4	35.2	35.8	50.9	61.9	74.3	47.95
New York,	54.2	43.8	41.8	30.3	33.0	34.6	49.9	59.4	72.0	46.55
Boston,	51.6	41.4	40.4	28.3	28.4	32.9	48.4	55.9	69.6	44.10
Richmond,	59.8	49.2	47.2	39.2	43.9	44.9	57.7	69.9	78.4	54.46
Asheville,	51.8	44.3	43.7	34.0	45.1	43.8	53.8	64.8	68.4	49.96
Aiken, S. C.	58.0	51.5	49.2	41.1	48.0	50.0				
Atlanta,	58.7	49.0	47.0	38.3	47.8	48.0	59.0	68.8	72.2	54.75
Chicago,	52.6	33.8	35.4	19.5	30.2	31.0	44.0	52.4	64.4	40.36
St. Louis,	57.6	41.2	42.8	25.9	40.0	40.4	54.0	62.8	76.6	49.03
Tucson,	70.8	58.9	44.4	49.2	52.8	57.0	61.8	69.6	79.2	60.41

It will be noticed by Table III. that of all the stations in southern Arizona, Phœnix shows the greatest variation of temperature, being the hottest in summer and the coldest in winter. Phœnix is at an altitude of 1068 feet, just midway between Yuma and Tucson. Under ordinary conditions we would expect to see the temperature there also midway in extremes between these two points. Although we have not at our command records of the relative humidity in the Salt River valley for more than a period of six months, we feel quite safe in assuming that the difference is due to this cause: Phœnix is situated low down in the valley near the Salt River, and, according to the well-known principles of gravity as applied to atmospheric drainage, the cold moist air settles in the most dependent localities. This is quite apparent by the sense of appreciation in the difference between the sensible and actual

temperatures, to which anyone will vouch who has driven through a river valley or an irrigated bottom in the arid region. The sensible difference between the temperature of Phœnix and other points of southern Arizona is decidedly marked; Phœnix being sultry in the hot season and chilly during the cold. The actual temperature shows greater extremes for reasons which depend on the fundamental principles of natural philosophy. Moist air is heavier than dry air, and is a poorer conductor of heat and cold. Consequently during the intense heat of summer radiation does not take place with sufficient rapidity during the night to lower the temperature to that of other localities outside the irrigated district. For the same reason in winter the heat of the sun during the day is not sufficient to raise the temperature to that of the other stations.

TABLE III.

Showing the relation between temperature and altitude.

Stations.	Altitude.	Mean Minimum.	Mean Maximum.
Yuma	141	42	106.3
Phœnix	1068	32	107 3
Tucson	2400	35	100.8
Prescott[1]	5389	20	84.9

It is not the presence of the river which causes the increase of relative humidity, for Yuma, which is situated at the junction of the Gila and Colorado Rivers, has the lowest relative humidity of any region of the Territory where the records are kept. But at Phœnix, for several miles above and below the city, the country is watered by irrigation and the soil is so thoroughly saturated that the level of the water beneath the surface has been raised from a depth of seventy to from twenty-five to thirty feet. This condition is no more pronounced at Phœnix than at any other point where irrigation is practised, as, for example, in northern Colorado where, prior to the introduction of irrigation, an extremely low percentage of moisture existed. Since all that region has been irrigated the relative moisture has been so increased that they

[1] Prescott, in northern Arizona. But the conditions are the same as for regions in southern Arizona at corresponding altitudes.

now have dews where formerly dews were unknown. The emanations from the growing vegetation also increase the relative humidity, although sufficient areas have not been irrigated to make any perceptible difference in the amount of precipitation by rainfall. What these artificial changes may bring about in time, no one can predict; but it is well known that bodies of water which are surrounded by irrigated regions, such as the Great Salt Lake, in Utah, are gradually increasing in volume. The surface of the Great Salt Lake has risen several inches in the last few years.

The report of the United States Weather Observer at Phœnix makes the relative humidity at that point, for the six months October to March, 1895–96, inclusive, 52.82 per cent. Records for Tucson during the same period are not obtainable. But compared with other years, when the precipitation was about the same as for this season, we find the relative humidity in the irrigated districts about 12 or 15 per cent. higher than at the other points in southern Arizona.

What the invalids from the north and east seek is a winter climate. Very few of them can be induced to go to the arid regions during the summer months; but with the advent of cold weather, after they have taken a few colds, they set out for a warmer clime.

The climate of Arizona is peculiarly adapted to the requirements of people suffering from pulmonary disease. They need a climate wherein they can live out of doors. No one will dispute the statement that out-door life is the one for the consumptive. Observations made by veterinary surgeons show that tuberculous cattle always improve when turned out to graze, and almost every case of tubercular phthisis which I have known to recover in the west has given a history of out-door life. By out-door life I do not mean that the patient is to spend a few hours each day in the open air, to return in-doors when he becomes a little fatigued. I mean that he should remain in the open air as do the cattle which are turned out to graze, day and night, and for weeks and months at a time.

A few months ago the writer visited the city of Sacramento,

and while there was taken by Dr. Wallace A. Briggs to see an interesting case. As the writer now remembers the case, it was as follows: The patient was a man, aged seventy-six years. He had contracted tubercular phthisis in the spring of 1850, while a resident of the State of Indiana. He emigrated to California at that time, and was compelled to make the journey on horseback. He stated that he was a year in making the trip, and, during that time, he recovered. Since then he has had no trouble save on one occasion when he visited New York. He then became worse, and was compelled to terminate his visit abruptly and return to the west. The writer examined this patient, found impaired resonance, increased fremitus, and all the signs of marked involvement over both apices and over almost the entire area of the left lung. By auscultation and percussion he detected a cavity in the left apex which was quite the size of a small orange. The patient stated that his lungs gave him no trouble whatever. Dr. Briggs informed me that he was suffering somewhat from tachycardia and was developing some symptoms of senile inanition, but was not troubled with his lungs.

This I considered an exceedingly instructive case, as it impressed upon me the necessity for out-door life in the treatment of pulmonary tuberculosis. I have pronounced hopeless many a case which was not as much involved as was this one, and seen my prognosis verified.

In order that the patient may live continuously in the open air for a period of several months, or, for that matter, for a year, or several years, a climate is required which is continuously warm and dry. Such a climate the United States does not possess. But the nearest approach to it is, I believe, in the deserts of Arizona. But the ideal climate cannot be found above the frost line. While I believe that the climate of southern Arizona possesses features which are far superior to those of any other section of the United States, yet I am compelled to admit that I think there are many climates which will in time be found to be superior. A desert region in the tropics, at an altitude sufficiently high to avoid a too intense

heat, would be superior to anything yet described, and would, according to my idea, fill the requirements much better.

What the people seem to look for is a winter climate. Even physicians rarely send their patients to the arid regions during the summer. This I consider a great mistake. I think the patients should be sent to the arid regions as soon as there is evidence of infection from the tubercle bacillus, and should be made to remain there until they are well, or until it is apparent that the case is hopeless. The climate of southern Arizona is a winter climate. We do not recommend that the patients come here for the summer, unless they enjoy or are able to stand the heat. For those who can stand warm weather, I think the summers much better than the winters; for, owing to the heat, everybody is compelled to sleep out of doors, and this I consider more important than any other feature of the climate.

It is not necesaary that patients be required to remain in one town, or at the same hotel, all the time. If they have the means to travel about there are many places of interest which they can visit and thus add greatly to their pleasures. For example, during the hot months of summer, when the heat of the lowlands becomes well-nigh unbearable, the patient may go to the northern part of the territory, where he will find, besides a dry, warm climate, many of the most interesting and remarkable natural wonders which the world possesses. Among these may be mentioned the Grand Cañon of the Colorado; the Wind Carved Rocks, and the Petrified Forests. Such attractions as the Moqui Indian villages, Cliff Dwellings, and the ruins of many ancient civilizations are frequent. In the Salt River Valley there are ruins of a city which must have contained a population of 300,000. These numerous ruins, which are found all over the territory, with their hieroglyphics and pictroglyphics, will well repay investigation by the student of ethnology. In the country surrounding Flagstaff, in the San Francisco Mountains, is the largest unbroken pine forest in the United States. Here, the sportsman may find deer, antelope, and bear, not to speak of small game or fish. After several

months of outing he may return to the southern part of the Territory to spend the winter. There, day after day, he may bask in the sun, and lead a life which is practically an out-door one, all the winter through. In southern Arizona, almost the entire rainfall occurs in two months, usually the months of August and December; while in the northern portion of the Territory the greatest precipitation is in the winter snow. Unfortunately we have not at our command the records of rainfall, humidity, and temperature for the northern part of the Territory, but it will suffice to say that it is no place to send tuberculous patients during the winter months.

The rainfall in the Territory of Arizona varies directly as the altitude (see Table I.). At an altitude of 7000 feet (Flagstaff) it is about twenty-three inches.

A warm dry climate is the one which seems most suitable for the tuberculous patient. We have already discussed the element of temperature in Arizona as compared to that of the Atlantic coast and the Mississippi valley. But there is another element in connection with temperature which we have not discussed, and which has, I think, a great bearing on the selection of a climate, I refer to the *sensible* and *actual* temperatures. In this matter I can do no better than quote from the report of Professor Edward M. Boggs, of the University of Arizona. In his article on the "Climate of Arizona,"[1] he says:

"The simple thermometer, no matter how accurate it may be, does not measure temperature as felt by animal life. Its records must be considered in connection with certain other data in order to afford a mode of comparison with the climates of other portions of the earth. We may term the reading of an accurate thermometer the *actual*, and the sensation of heat or cold as felt by the higher orders of animal life the *sensible* temperature. Neither of these is a measure of the other. The fact is well known to meteorologists, that the thermometer alone cannot indicate the *sensible* temperature, but that the

[1] Arizona Agricultural Experiment Station, Bulletin No. 20.

humidity of the air must be considered in connection with the actual temperature. This fact is also known to dwellers in the arid region, but it is not known to the majority of otherwise intelligent people throughout the world.

"Where the percentage of atmospheric moisture is high both extremes of temperature are felt to be greater than the thermometer indicates. Everybody knows something about that condition of the weather which is variously termed 'sultry,' 'close,' or 'muggy.' These terms describe the result of a combination of heat and moist air. This is the condition which exists commonly in the tropical regions of the world where the rainfall is heavy, and in the same way, though in a smaller degree, throughout the United States outside of the arid region. It is especially noticeable in the States bordering on large bodies of water, such as the Gulf of Mexico or the Great Lakes, and is conspicuously absent from the greater portion of Arizona.

"In the dry air of this territory sunstrokes are unknown, while in the Mississippi valley and in the States lying eastward whole columns of the newspapers are filled with accounts of prostrations from heat; and the fatalities are numerous whenever the thermometer indicates 90° F., or upward. At many places along the seacoast, where the humidity always remains near the point of saturation, a temperature of 85° brings excessive discomfort, and exertion or exposure to the sun is extremely hazardous. Men and the lower animals perform in safety their customary labor beneath the cloudless skies of Arizona, under the highest temperature ever experienced here. The dry air induces exceedingly rapid evaporation of the abundant perspiration, thus keeping the body at a comparatively low temperature. As a matter of course, the supply of fluid must be maintained, hence the great thirst so often experienced by travellers in desert regions, and the imperative necessity for an adequate supply of drinking water. Of all the lives lost on the desert stretches of western America—and their number is not small—not one is directly attributable to heat, but to thirst. The experienced traveller provides an

ample supply of water and fearlessly invades the worst desert yet discovered.

"An amount ranging from fifteen to perhaps thirty degrees, according to the humidity, should be subtracted from the maximum *actual* temperatures in Arizona during the hot season, to indicate the *sensible* temperatures. In like manner, the dry air of the arid regions enables extremely low temperatures to be endured without discomfort. The winter cold of the Canadian Northwest Territory is much less disagreeable than that of the United States immediately south of the Great Lakes. The lowest temperatures known on the high plateau of Arizona bring less discomfort than a chilly day in New Orleans."

It is when we come to study the relative moisture which exists in the atmosphere of Arizona that we see the most striking peculiarity of the climate. Table IV. shows the difference in relative humidity between the climate of Tucson and that of other portions of the United States. It will be noted that the relative humidity does not always depend upon the amount of precipitation, as for example, San Diego, Cal., which has a rainfall almost as deficient as that of Tucson.

TABLE IV.

Showing the relative humidity at various points in the United States and at Tucson, Arizona.

For the nine months, October to June inclusive, 1891–92.

Stations,	8 A. M.	8 P. M.	Average.
Boston	70.0	66.4	68.2
New York	73.4	69.7	71.6
Chicago	80.2	75.5	77.8
Norfolk, Va.	80.4	73.0	76.7
Atlanta, Ga.	78.8	65.4	72.1
Mobile, Ala.	85.2	77.4	81.3
Jacksonville	79.8	72.2	76.0
Meridian, Miss.	85.7	73.2	79.4
San Antonio	70.1	50.4	60.5
Los Angeles	77.0	65.4	71.2
San Diego	78.2	69.1	73.6
Asheville, N. C.[1]	......	......	68.7
Tucson, Arizona	56.5	28.7	42.6

[1] Therapeutic Gazette, October 16, 1893.

I think that this feature of the climate of Arizona is what makes it so beneficial to "pulmonary" patients. I know of no country which possesses, in addition to a moderate altitude, a warm equable temperature with such a low degree of relative moisture. If it be a dry atmosphere which the patients need, and I think all observers agree that a dry atmosphere is the most essential element, then Arizona can surpass anything on this continent, if not, indeed, anything in the world.

Were we, in our report, to exclude the two months of heaviest rainfall, the mean relative humidity would be fully 10 per cent. lower than that given in the table; while in other portions of the United States there is no corresponding decrease. For example, in the month of June, 1892, the average relative humidity was 20 per cent., and for August and February of the same year (the months of greatest rainfall) the average relative humidity was respectively 38 per cent. and 69 per cent. During the greater part of the year the inhabitants of southern Arizona sleep out of doors. I have slept, night after night, for weeks at a time, without being aware of the presence, even of dew. It is difficult, at first, to induce the "tenderfoot" to sleep in the open air. He has visions of tarantulæ, scorpions, and centipedes, which are disquieting. But in the course of time, he learns that these insects are so rare as to be curiosities, and their sting is to be dreaded not so much as that of a California flea. The sensational Arizona tales of poisonous reptiles and insects, of murderous Apache raids, and of cowboy and desperado shooting scrapes exist only in print. They have no modern foundation in truth.

Many physicians in the East order patients to California for the winter, apparently with a view of sending them to a dry climate. California is deficient only in rainfall. If the reader will look at Table IV. he will notice that relative humidity in southern California is as great, and in some instances greater, than that of the Atlantic coast. He may also be surprised to know that many of the best physicians in California regularly send their tuberculous and asthmatic patients to Tucson. California is a beautiful country, and is a delightful country in

which to live if one can stand a high percentage of humidity. But the fogs which come in from the sea, and the emanations from the vast irrigated regions, make it far inferior to the inland desert regions for phthisical patients. I think it may be assumed as a general rule that wherever there is irrigation there is a high degree of relative humidity. It is my opinion that patients suffering from pulmonary phthisis should never be sent to an irrigated district. In addition to the high degree of humidity there is usually associated the miasmatic micro-organisms. Indeed, some of the California physicians have declared that "irrigation and malaria go together."

The city of Tucson has, in my opinion, advantages as a health resort which cannot be equalled anywhere in North America. I know of no locality where such a moderate winter climate and such a low degree of relative humidity are combined with the same latitude and altitude. It is no longer considered imperative to send tuberculous patients to an altitude of 5000 feet or over. In fact, clinical experience has proven that more frequently patients require to be sent to an altitude of less, rather than more, than 3000 feet. The altitude of Tucson is 2400 feet, and that seems to be amply high for all but the most exceptional cases. The city is situated in a basin near the underground Santa Cruz River. It is completely walled in by massive mountain ranges. To the north is the Santa Catalina range; to the east, the Rincon; to the south, the Santa Rita; and on the west, the Tucson. Each of these ranges has an altitude of 5000 feet at least. Mount Lemon, the highest peak of the Santa Catalinas, has an elevation of over 7000 feet, and Mount Wrightson, in the Santa Ritas, reaches an altitude of nearly 11,000 feet.

Surrounded as it is by this impassable wall, the city is protected from wind and rain. The humidity is less than that of any other city in the United States. Moreover, it will always remain virtually unchanged, for irrigation is not, and never can be, carried on to any extent. The reasons for this are two: First, there is no water; and second, the soil is such that nothing more than a few shade trees and small fruits can be

grown, and these only when great care and attention have been devoted to them. I must make an exception in regard to flowers. Roses bloom in the gardens in magnificent profusion almost every month in the year.

The scenery at Tucson is as impressive as anywhere in the Rocky Mountains. The gorgeous sunrises and sunsets beggar description. There are fine drives, cañons, and ruins. The characteristics are those of the desert, the charming peculiarities of which are novel and entertaining to people who have been accustomed to live in the humid regions.

I wish to call attention to one more of the features of southern Arizona before I close. I refer to the sunshine. During the nine months, October to June inclusive, 1894–95, there were but twenty-five cloudy days, and nine of these were in one month. Some idea of the transparency of the atmosphere may be had when I state that, at mid-day, and with the unaided eye, I have seen Venus when it was but ten degrees east of the sun.

The writer feels kindly toward Arizona. One year ago, in Philadelphia, he was attacked with two hemorrhages from the lungs. He had a bad cough, and was losing flesh rapidly. On the advice of a distinguished member of this Society he went to Tucson. Since that time he has gained twenty-six pounds in weight, and now is a well man.

TREATMENT OF BRONCHIAL HEMORRHAGE.

By CHARLES E. QUIMBY, M.D.,
NEW YORK.

Among the many causes tending to discourage the younger practitioner and to bring the medical profession into disrepute with the laity, few are more potent than the widely divergent and frequently contradictory therapeutic methods advised by recognized authorities in the treatment of common conditions, concerning the etiology and pathology of which there is little if any dispute. The therapeutic statements of college text-books even are apt to be diffuse, giving all that is advised by any one rather than dogmatically affirming what the author has himself determined to be good. Such a state of affairs almost justifies the accusation that, however scientific our theories may be, our practice is purely empirical. And when we remember that divergence among the leaders becomes chaos in the profession at large, there seems to be reasonable excuse for this present attempt to boil down current methods of treating the pulmonary hemorrhages of phthisis in the hope that possibly we may crystallize out some clearly defined line of treatment for a most distressing and terrifying condition to which this Association might even affix its stamp of approval. Any formulated statement must be both positive and negative: it must not only approve useful but must condemn injurious measures.

That we may fully appreciate the significance of the varied treatments to be presented and clearly recognize their relations to underlying principles of therapeutics, it is necessary to consider the indications presented by a case of bronchial hemorrhage. Of the two causative factors, vascular tension

and degenerative changes in the vessel walls, it is evident that the latter are not subject to modification within such time as will render them a basis for treatment of an existing hemorrhage. The possibilities of influencing the arrest of pulmonary hemorrhage must, therefore, be sought in one or more of three universally accepted lines:

1. Modification of vascular tension.
2. Increase in the coagulability of the blood.
3. Mechanical and chemical aids to the formation of a clot.

It is in the first of these that there has been the greatest apparent antagonism of methods; an antagonism, however, which I believe is more seeming than real as regards the object aimed at, for I am convinced that the advocates, quite as much as the opponents of the vaso-constrictors, are seeking to develop a capillary anæmia, and that there is logical support for both methods. To my mind the question is not "Which is right and which wrong?" but which is better and best supported by argument and practice.

So long as we recognize a gangrene due to the prolonged use of ergot no one can well deny that extreme arterial constriction produces capillary anæmia. Admitting this, however, and also that bronchial hemorrhages are capillary, these very admissions, upon which alone the use of ergot can be justified, appear to me to become condemnatory of such use when considered in connection with the anatomical relations of the pulmonic and systemic circulations; for all the vaso-constrictors produce systemic even more strongly than pulmonic contraction, and the consequent increase of arterial tension must be transmitted back through the heart and pulmonary veins until it is felt in the capillary circulation of the lung. But even if this were not important, there would seem to be the greatest uncertainty of producing and *maintaining* the requisite degree of constriction to cause persistent capillary anæmia, and anything short of that must increase the hemorrhage, for even involuntary muscles soon become exhausted and refuse to respond to the sharpest stimulation.

But most serious of all appears to me the objection derived

from the pathology of the disease. It is not questioned that mural degeneration of the bleeding vessels is the most important cause of the hemorrhage, yet it is in just these vessels and those of immediately adjacent tissue, which also cannot be supposed to have escaped entirely degenerative changes, that muscular contraction is absolutely necessary. If but one of them is unable to respond to the stimulus of ergot, or to bear the increased strain, all arterial contraction becomes not only useless but absolutely harmful. This argument alone, with certain clinical evidences that ergot quite as frequently augmented as retarded bronchial hemorrhage, led me some eight years since to abandon the use of the vaso-constrictors and their ally the ice-bag, which I had been taught as a student, and to direct my arterial therapeutics to the development of low tension in the pulmonary circulation. It is difficult to understand how anyone can deny that lowered vascular tension is a most important factor in the arrest of hemorrhage. Yet such a denial seems necessary to justify the belief that no measure within our reach can influence bronchial hemorrhage. Those who express such a belief are nevertheless most strenuous in insisting that these hemorrhages are never fatal—a claim which is really equivalent to admitting that they are finally arrested through a lowering blood-pressure, since that is the only constant factor in such cases.

I, therefore, place as the first and most important indication for treatment, to lower the pulmonary vascular tension. This is accomplished by both active and passive measures. Since muscular action and mental anxiety are cardiac and vascular stimulants, complete rest, both physical and mental, is imperative, not only for its direct influence in quieting the heart's action, but also to increase the influences of other measures. It is never possible to say that a slight hemorrhage may not suddenly become severe; absolute rest in the fullest meaning of the word should, therefore, be insisted upon in all cases. Personally, I make *no* examination of the chest until the hemorrhage has ceased, as none of my therapeutic measures are influenced by the location of the trouble, it being under-

stood, of course, that sufficient is known to differentiate a hemorrhage of phthisis from one of cardiac or other origin. An initial dose of some preparation of opium I regard as routine treatment in all cases, for not only is the general nervous excitement, which is so constantly present and so often the predominant cause of the vascular disturbance, controlled thereby, but rest of the affected lung is also secured through the coincident arrest of cough. It is at this point that we find the only exception to the general rule of absolute rest.

In cases of profuse hemorrhage probably less is gained toward the arrest of the bleeding by complete arrest of cough than is lost in the dangers incident to the retention within the lung of large amounts of blood.

Under such circumstances morphine should be used to modify not to arrest the cough.

Active diminution of pulmonic vascular tension is most fully obtained by, first, general lowering of blood-pressure; second, diversion of the blood from the lung to other parts. To secure the former my main reliance is upon aconite, which is given in a full initial dose and repeated as required to maintain the desired vascular quietude. A certain proportion of cases, however, present the symptoms of shock from the outset, although often with rather a tense pulse. In such conditions morphine alone, in small repeated doses, not only relieves the shock but lowers vascular tension and equalizes the circulation.

The possibility and importance of diverting the blood from the lung seem to me to have received far less attention than they deserve, not only in connection with bronchial hemorrhage but in other pulmonary diseases as well.

That such modifications of circulation as can be developed by direct or reflex action have a powerful influence upon even inflammatory processes I am fully convinced. This much at least is unquestionable, that large derivations of blood to one part of the body must result in relative anæmia elsewhere. To obtain such a derivative action in bronchial hemorrhage we may avail ourselves of the thoracic wall, the alimentary mucous membrane, and the abdominal glandular organs. To this end

in all cases of more than mild bronchial hemorrhage I apply counter-irritation, by means of turpentine stupes or mild mustard plasters, to the entire back and sides of the thorax, endeavoring so to temper them as to maintain a sharp capillary hyperæmia, which is continued until all bleeding has been absent for some hours. In the milder cases a similar and sufficient derivation is more easily obtained by way of the alimentary canal alone.

Of all the therapeutic measures recommended for hæmoptysis none has so stubbornly withstood the shock of time as common salt. Having seen several of the "old women's remedies" of my youth reappear in the garb of "modern scientific discoveries," I was led to a consideration of the action of salt, which has resulted in my using it constantly for hæmoptysis upon what I consider a truly scientific basis.

Modern therapy may accept the teaching of empiricism when able to justify itself in so doing. It is well known that the abdominal vessels are capable of containing a large proportion of the blood of the body, and we have long recognized that cerebral anæmia or even shortness of breath often attend a profuse diarrhœa, yet it is only very recently that we find in current text-books saline cathartics advised in pulmonary hemorhage for the distinct purpose of drawing the blood to the abdominal vessels and to lower arterial tension. Undoubtedly a more pronounced and persistent effect is gained from the Epsom or Rochelle salts given to the point of free catharsis, but I am convinced that a *primary* hyperæmia of the alimentary mucous membrane is developed more speedily by reflex action through the gustatory nerves from salt taken in the mouth, and that this hyperæmia is sufficient to have a decided and valuable influence on pulmonary circulation.

Since physiology and physics thus justify the use of salt, I invariably give it, to be taken *dry on the tongue*, supplementing its action by the more powerful salines when at hand, or as soon as obtained, in the more severe cases. The action of salt is purely reflex through the nerves of taste, and its value does not depend upon the amount taken but upon its persistent use.

Personally, I have found the salines sufficient, but in very obstinate cases there is no reason why the more stimulating or irritant cathartics may not be given.

As regards the second class of remedies, those used for the purpose of increasing the coagulability of the blood or producing a local astringent effect, I am incompetent to speak. I can only say that the possibility of their reaching a bleeding point in any efficient amount always seemed to me so remote that I have never yet prescribed one of the astringents for pulmonary hemorrhage.

My position is much the same in relation to the third class. While astringent inhalations seem, *à priori*, more reasonable than internal astringents, I have never found it necessary to use them. A most gratifying experience in the mechanical treatment of pulmonary disease, however, has led to some attempts in rather severe cases of hæmoptysis to develop atmospheric compression of the bronchial vessels by compelling the patient to expire through a restricted opening, as a pipe-stem, straw, or even the compressed lips. Not enough cases have been seen to justify any positive statements, and the measure is presented rather as a suggestion, trial of which is justified by the results obtained by pneumatic differentiation.

In presenting a summary of my own treatment of bronchial hemorrhage no claim is made of anything new; but simply that it is based upon a well-defined principle, has a definite object in view, and that the measures form a harmonious whole without contradictions. It includes: 1st, rest; 2d, morphine; 3d, aconite or other vascular sedative; 4th, dry salt and a saline cathartic; 5th, counter-irritation; 6th, obstructed expiration. It excludes: 1st, astringents; 2d, ice externally; 3d, stimulants; and, 4th, the vaso-constrictors.

The following statements are the answers in substance of the several gentlemen named to this question: "Will you state just what you would do if called to a case of moderate or severe hæmoptysis, it *being assumed* that it is a *bronchial hemorrhage* dependent upon *tubercular disease* of the lung?" It was understood that the answers do not include what might be done as a

placebo for the patient and friends, nor indicate treatment in detail.

The answers are as follows:

Dr. Delafield affirms these two broad propositions as indicating his treatment of bronchial hemorrhage:

1. Such hemorrhages are never fatal, and are dangerous to life only through the succeeding extension of the tubercular process.

2. No therapeutic measure has any appreciable effect in determining the arrest of the hemorrhage.

He, therefore, limits his treatment to reassuring the patient and making him comfortable. He gives no drug, and, not regarding rest as of any importance, he allows the patient to move about or remain quiet at pleasure.

Dr. Draper follows a rather expectant plan of treatment in the milder cases, but when the hemorrhage is well defined in a case of definitely determined tuberculosis his chief reliance is upon full and absolute rest in connection with opium, although he generally gives some ergot. When he has reason to believe that the hemorrhage is localized and from a congested area about a tubercular deposit he applies ice to the chest over the seat of hemorrhage. He has no faith in the mineral astringents, and never uses them. He does not refer to stimulants or digitalis.

Dr. Jacobi regards every bronchial hemorrhage in phthisis as presenting serious possibilities, having seen a primary hemorrhage prove fatal in a patient who had never presented any symptoms or been suspected of having any tubercular disease. He insists upon absolute rest, allows no talking, and makes only such examination of the chest as is necessary to determine the seat of the hemorrhage, which can be done by auscultation alone. He allows the patient but little fluid.

In therapeutics he relies mainly upon acetate of lead and opium, though he directs that digitalis be given at the outset, and followed by injections of ergot from time to time. The lead he gives in divided doses uniformly through the day, and thinks it has been condemned by others because used in too

small doses. He states that an adult patient may take from 2 to 4 grams of acetate of lead in twenty-four hours, and continue the dose for from two to four days. The lead is given in combination with opium, amounting to daily doses of from 1 to 4 decigrams, the indications for the opium being the general quieting effect. The digitalis, on the other hand, he says should be given in one or two large doses of from 8 to 10 minims of a good fluid-extract at the outset, and repeated in from six to eight hours. The ergot also is given in an initial full dose and repeated as may be necessary to maintain arterial contraction.

Externally he applies ice over the seat of the hemorrhage and ligates the lower extremities in severe cases to retard venous flow. In all cases the bowels are opened freely and kept so until the hemorrhage has fully ceased.

Dr. Janeway attaches much importance to the physical term in the "absolute rest" upon which he insists in all cases, not allowing any physical examination even, except auscultation, until at least four days after the hemorrhage has entirely ceased.

Therapeutically he employs opium in all cases, both for its influence on the general nervous excitement and to quiet the cough when that is prominent. For a direct effect upon the hemorrhage itself he regards atropine as preferable to ergot, having but little if any faith in the latter. He gives cathartics to obviate the constipating effects of the opium, and thus to avoid the dangers incident to straining at stool. When the pulse is frequent and strong and not quieted by the opium he uses aconite.

Externally he applies the ice-bag or counter-irritation to the affected side, rather giving the preference, if any, to the counter-irritation. In case the hemorrhage is prolonged and not arrested by the above treatment he resorts to inhalations of turpentine, with the proviso that they must be begun carefully, and at once stopped if they excite an irritative cough.

With reference to astringents he expresses the opinion that they are of no value, and says that he does not employ them,

at the same time adding, that if he did, acetate of lead would be the one chosen.

Dr. Kinnicutt has so little confidence in therapeutic measures that he gives absolutely nothing by the mouth. Nevertheless, he ascribes the very greatest importance to rest, absolute and continuous, physical and mental. Recognizing in these cases not only the prominence of nervous excitement and mental shock and their influence in producing vascular activity, but also the physical and local disturbance produced by cough, he employs morphine hypodermatically to control the former and moderate the latter. The use of ice externally he speaks of rather doubtingly, and does not employ it except in the more severe cases. Beyond this he does nothing, having absolutely no faith in astringents or ergot.

Dr. Peabody similarly bases his treatment upon that complete rest which is made possible and most fully obtained by hypodermatics of morphine. He lays rather more stress, however, upon the value of ice externally for its action in causing a reflex contraction of the pulmonary vessels, and constantly employs ligature of the extremities in all severe cases. Negatively he condemns all astringents as absolutely bad except acetate of lead, which is thought to have a slight value in cases of moderate and persistent oozing, but to be entirely worthless in severe hemorrhage. He also specifically opposes all inhalations.

Dr. A. A. Smith also regards absolute all-around rest as the *sine qua non* in the treatment of bronchial hemorrhage, and, believing that mental anxiety from fear is a prominent cause of an excited circulation, he pays special attention to relieving this condition in addition to securing the usual physical quiet. His medication is begun by a hypodermatic of morphine, which he specifically states is *not* to be combined with atropine on account of the effect of the latter in stimulating the circulation. In addition to the morphine he uses bromide of sodium when there is great mental excitement.

If the hemorrhage starts with a rise of temperature, he uses one of the coal-tar series, of which phenacetin is considered

the best. They are intended to quiet an excited circulation, and their dosage is to be governed by this effect. He allows patients to continue the use of salt as a placebo, and is not displeased if it causes nausea, as that is attended by a diminished circulation. Dr. Smith makes special mention of continuing the opiate for several days. He also places his patients on a milk diet at once, and, after allowing them to get up slowly, still restricts their diet, forbidding for some time all red meats, stimulants, and stimulating food. He regards all the astringents as utterly worthless, and ergot and ice externally as equally bad.

Dr. A. H. Smith is no less strenuous in insisting upon rest and opium as the basis of all treatment in pulmonary hemorrhage, making special mention of the dangers from percussion and an over-zealous physical examination.

Morphine he uses for its quieting effect and to moderate cough. His further choice of drugs is determined by the character of the pulse. If this is hard, tense, and small, or if the patient suffers from a sense of oppression in the chest, he uses nitroglycerin. More commonly he gives ergot, and this he regards as especially valuable when the pulse is soft and weak and in cases of distinctly capillary hemorrhages which are moderate but persistent. For the astringents he has no use.

Dr. William H. Thomson, while not regarding it as entirely unimportant, nevertheless lays no great stress upon rest in these cases, unless the hemorrhage comes on with high temperature or there is reason to believe that the bleeding was started by exercise or physical strain. Practically he relies almost entirely upon acetanilid and atropine, which he gives about every three hours, in doses of 3 to 4 grains of the former combined with $\frac{1}{100}$ of a grain of the latter. In cases which give the history or present the physical evidences of an antecedent pleurisy he straps that side of the chest firmly, believing that the tension from old fibroses is often a prominent cause of these hemorrhages. In these cases also he would insist upon such quiet as would prevent strain of pleuritic adhesions. He does

not employ the astringents or ergot, and made no mention of any external applications or inhalations.

In making a summary of these several reports, that of Dr. Delafield may be omitted as being negative on all points, and the number thus reduced to eight, for, though Dr. Delafield uses nothing himself, I did not understand him to imply that all measures adopted by others were *injurious* as well as useless. And since it requires a reputation commensurate with that of Dr. Delafield to enable one to follow his plan of treatment, the most of us must still seek to know at least what we may do with the greatest safety.

Of the remaining eight, all attach the utmost importance to complete rest, except Dr. Thomson, who differs from the others only in degree.

All but one also initiate their treatment by a vascular and nervous sedative, six of the seven relying upon opium for this purpose, and one preferring acetanilid. Dr. Jacoby, who stands alone on this point, also uses opium, but as an adjunct to an astringent and evidently not as a vascular sedative, since he precedes it by the most powerful vascular stimulants, digitalis and ergot. He is also the only one who employs astringents as a *method* of treatment, as Dr. Peabody, the only other who does not unqualifiedly condemn them, not only limits their use to the mildest cases, but speaks of that use rather indifferently. Dr. Jacoby is entirely consistent, however, in adding to the astringents the vaso-constrictors, digitalis and ergot. In the use of digitalis he is again alone, for the ergot he is supported by Dr. A. H. Smith in certain cases, and by Dr. Draper doubtfully. When it comes to the question of attempting to produce local *contraction* of the pulmonary vessels alone by the reflex action of cold, four of the seven who follow a general plan of *vascular dilatation*, Drs. Draper, Janeway, Kinnicutt, and Peabody, mention it as a possible part of treatment, though Dr. Janeway gives the preference to counter-irritation, and Dr. Kinnicutt considers it of rather uncertain value. Two, Drs. Thomson aud A. H. Smith, make no mention of it, while Dr. A. A. Smith distinctly objects to it.

Of the entire eight, Dr. Janeway alone refers to counter-irritation as a method of depleting the pulmonary circulation. Two only make mention of cathartics, and that without special reference to salines or for the special purpose of lowering arterial tension.

The treatment of bronchial hemorrhage then, as deduced from these reports by a majority vote of seven to one, should be upon the general plan of vascular sedation with a lowered blood-pressure, and would include the use of: 1st, rest; 2d, morphine; 3d, vascular sedatives; 4th, ice (perhaps); to which may be added in the same line, as having been mentioned without opposition, 5th, saline cathartics; 6th, ligation of the limbs; and, 7th, counter-irritation in place of ice.

It would exclude the use of astringents or vaso-constrictors.

THE TREATMENT OF HÆMOPTYSIS IN BOSTON.

By A. COOLIDGE, Jr., M.D.,
BOSTON.

In order to ascertain as far as possible the actual treatment of hæmoptysis in Boston I sent a circular letter to some of our practising physicians, who, from their medical services in our institutions have a large number of general medical cases under their care, or, from their position as teachers of clinical medicine, shape the routine of younger practitioners. In my letter I asked for a few words only, especially under the following heads: At the time of an attack of hæmoptysis what general directions are given? What drugs have you found of use? What directions and drugs have you found useless? For a patient liable to attacks what general mode of life is recommended? What climate is indicated? What drugs are useful?

By limiting myself to general outlines it seemed to me that a clearer composite picture could be drawn than by collecting more minute details of individual methods. The resulting picture is very simple, and I shall consequently be very brief. In combining these answers I must assume that the more important means are those most frequently mentioned, although in some instances I have no doubt that certain simple directions were omitted as being taken for granted. To my letter I have received 18 answers, and combined them as follows (the figures placed in the text show the number of letters in which the preceding drug or general direction is recommended):

At the time of an attack rest is of the first importance. The patient should be kept in bed, 10; preferably in a semi-recumbent position, 3. He should be kept quiet, 18; and not be

allowed to talk, 9, either aloud, or in whispers, or to move, 3. It is important that he should not become excited nor alarmed, 7. As far as possible desire to talk should be resisted, 3. The room should be cool, 3; all food liquid and cold, 8. Ice or cold compresses may be applied to the chest, 4, if the hemorrhage is severe and there is no shock. Stimulants must be avoided. It is better to make no physical examination. The thorax may be compressed with an elastic bandage.

By far the most important drug is opium in some form, 17. It is the only one in which much reliance can be placed, 7. Morphine is the best preparation, 10; and may be given subcutaneously, 3. Codeine may be substituted for it, 3. The object of the opium or its alkaloid is to allay cough, 10; and restlessness, 4. Other drugs which are used with more or less apparent benefit, if not contraindicated are: gallic acid, 2; tannic acid, acetate of lead, 2; aconite, tincture of the chloride of iron, veratrum viride, myrtol, and hamamelis, 1 each; The value of ergot or its preparation, ergotine, is very doubtful. Six of my list use it as routine, but of these 4 doubt its usefulness. On the other hand, 8 find it useless, and 2 consider it harmful. Other drugs and methods tried and abandoned as of no value or harmful are astringent or hæmostatic drugs in general, tannic and gallic acid, salt, astringent vapors and ice externally, 2 each.

The treatment of a case of pulmonary tuberculosis or of any other condition is not often changed on account of a tendency to hæmoptysis, 9; except that overexertion is forbidden, 3; or great muscular strain, 6. But a patient may be advised to live quietly and avoid anything which calls for increased action of the heart, or respiration, 6. Undoubtedly different directions are given according to the severity of the attacks.

In regard to climate, the principal question in hemorrhagic cases is that of altitude, and on this point there is a direct difference of opinion. Several are opposed to high altitudes, 7; or even to any elevation at all, 1. On the other hand, others consider high altitudes not contraindicated, 5; but even

beneficial. Some of the former send their patients to Maine or the Adirondacks in summer, and to Bermuda and the South in winter, 3. In general, except for the question of elevation, the climate is not changed by the occurrence of hæmoptysis.

There is no drug given as routine to diminish the tendency to hæmoptysis. Creosote or guaiacol and cod-liver oil may be of value, 2. Special indications may be met by diminishing or increasing the heart's action, 2, or allaying cough.

The summing up may be made very brief. For the arrest of hæmoptysis there are two essentials, rest and opium. To prevent its recurrence the rational treatment of the underlying disease and the avoidance of strain. In concluding I wish to express my thanks to the gentlemen who have kindly answered my letter and made it possible for me to take part in this discussion.

THE PRESENT TREATMENT OF HÆMOPTYSIS.

By J. H. MUSSER, M.D.,
PHILADELPHIA.

The time allotted for your reporter to secure the views of the Philadelphia physicians on the modern treatment of pulmonary hemorrhage was so short it was impossible to do more than select a few of the prominent practitioners in Philadelphia for the purpose of securing their views upon this important subject. Letters were mailed to fifteen practitioners, some of whom are also teachers and physicians to large hospitals. Thirteen replies were received. For convenience the various methods employed and the drugs used will be noted *seriatim.*

1. *Rest.* This, as was naturally expected, was enjoined by all. In nearly every instance in addition it was urged that the rest should be in the recumbent posture. A number, however, urged that the patient should be in a semi-upright position, or the shoulders elevated. In order to more absolutely secure this rest the internal use of opiates, or of the bromides, was advised by most of the writers, although it is fair to state the latter drug was recommended by one person only. In order to more perfectly secure rest the cough is to be controlled, and this is obtained by the use of opiates also.

2. *Local applications.* Cold on the chest, in the form of ice usually, was advised by five of the reporters. In two of the five its use was advocated in hemorrhages in the second or third stage of tuberculosis only. Most of them required the ice to be applied over the affected part, that is, the cavity or portion of the lung the seat of disease.

3. *Diet.* This was referred to by two only. One advised liquid diet, the other a readily digested but not low diet.

4. *Inhalations.* The use of inhalations was objected to by three of the reporters, advocated by one, and not referred to by others, therefore probably not used in their practice. The one who advised an inhalation suggested that it must not be used if there is much cough.

5. *Dry cups.* One of the reporters suggested the use of dry cups if there appeared to be congestion of the lungs associated with the bleeding. Cupping was not referred to by others.

6. *Internal remedies.* The internal remedies advised may be divided into three classes:

First. Drugs to quiet the nervous system and allay the cough.

Second. Drugs to allay arterial excitement.

Third. Astringents.

All enjoined the use of opium with the exception of two, both of whom, I think, overlooked suggesting it. Opium or its liquid preparations were advised, or the hypodermatic use of morphine insisted upon. Morphine, however, was objected to by one very strongly. Professor Hare believes that the use of morphine causes more blood to be sent into the leaking blood-vessel of the lung, and advises the bromide of sodium in full doses by the rectum if it cannot be given by the mouth, and, if the pulse is strong, combined with chloral in doses of five or ten grains. No other drugs were advised either to quiet the cough or the perturbed nervous system.

Arterial sedatives were advised by two of the reporters. One thought well of the use of aconite in the hemorrhage of the early stage of phthisis, or of antipyrine in one- or two-grain doses with morphine. Another thought that cardiac sedatives were admissible when given in moderate doses for hemorrhage in either the first or second stage, as they lessened the amount of blood lost and favored clotting.

Considerable difference of opinion existed as to the use of astringents. By some they were advised without qualification; by others their use was admitted, although their value was doubted. Thus one reporter said he used ergot in early hemorrhages with grave doubt. Another that he used ergot and gallic acid, but did not believe they were of much account. They were

given, however, with the hope that they might be of service. Others indorsed with a qualification the use of astringents. The following were recommended: Ergot or ergotine by the mouth or hypodermically, turpentine, gallic acid, fluid extract of hydrastis, the oil of erigeron, acetate of lead, sulphuric acid, lycopus virginica. Gallic acid advocated by the majority of the reporters. Ergot advocated by five. Its use is not mentioned by four, and two report against it absolutely, and two others consider it of doubtful use. Acetate of lead has two advocates, turpentine two, and the other astringents one each. Of turpentine it may be said that one of the reporters considered it the only hæmostatic of any value; another thinks turpentine or terebene of greater service than any other drugs in the late hemorrhages of tuberculosis, particularly if combined with morphine and antipyrine. Before leaving the subject of hæmostatics it is worth while to note that common salt was advised by one of the reporters, a tablespoonful of the dry salt to be taken at once, and repeated if necessary.

It will thus be seen by this hurried and rather incomplete analysis that the method of treatment of pulmonary hemorrhage is still unsettled. It is a pleasure to have a report come with the statement that "the action of all remedies is doubtful."

It is readily observed by the above report that all agree as to the absolute importance of rest, and the use of opiates or other drugs for their allied effect. The varied answers as to the use of astringents rather go to show that they are not of much account. From a study of the reports received by the writer, especially because of the exhibition of such wide difference of opinion, it seems fair to conclude that this class of drugs is of little value in the treatment of pulmonary hemorrhage. It is true the astringents have their advocates, and they are high in authority. Unfortunately, others just as high in authority consider their use of doubtful value or absolutely without effect. Moreover, the lack of unity in the selection of one drug appears to show that but little can be expected from the use of any of their class.

An attempt was made to find out whether the practitioners had a different mode of treatment of hemorrhage when it occurred early or late in the disease. A few only made the distinction. Most of them agreed that the treatment was the same, whether hemorrhage took place in the first or later stages. One of the reporters insisted on small doses of astringent in the first stage, and of large doses in the latter stages. Another insisted on the local use of ice in the latter stages only; another that turpentine should be used at this period. One of the reporters insisted that the recumbent posture should not be assumed when the hemorrhage took place late in phthisis, and that opium should not be given or the cough in any way allayed at this period of the disease, on account of the danger of the accumulation of blood in the air-cells. Apparently, from the above, no difference in the treatment of the two stages existed.

From this review it may be said that the treatment of hæmoptysis, as followed out by representative practitioners in Philadelphia, includes rest, mental and physical, the local application of ice, the use of opium, and, with considerable doubt as to their value, the use of astringents of the class referred to in the above analysis.

The writer of this report fully indorses the above in so far as rest, ice, and opiates are concerned; he is not willing to indorse the use of astringents. He would urge the use of dry cups in certain well-defined conditions, and favors the use of saline catharsis if the patient is robust and the condition of the primæ viæ points to its necessity.

THE TREATMENT OF HÆMOPTYSIS.

By R. H. BABCOCK, M.D.,
CHICAGO.

In response to a request from our President to ascertain the treatment of pulmonary hemorrhage employed by Chicago physicians, I addressed letters to thirty representative practitioners, most of them teachers in one or more of our faculties. Twenty-seven replies were received, from which the following figures have been tabulated:

Eighteen insist upon absolute physical rest in recumbent or semi-recumbent positions, and three added that they permitted no talking. Cold to the chest is ordered by thirteen, usually in the form of ice. Nine administer opium, and eight morphine hypodermatically, making seventeen in all who employ opium in some form or other, either to allay cough or to promote mental calm. A few state that opium is their sheet-anchor. Ergot is employed by fifteen, a few, however, stating some doubt as to its utility. One said he thought ergot only proved efficient when in doses sufficient to produce nausea. One administers Tancret's ergotin hypodermatically in doses of from six to eight minims, and mentioned no other treatment. Eleven are positive that ergot has no efficacy in controlling pulmonary hemorrhage. Six make use of acetate of lead, either with or without opium; two tannic acid, two gallic acid, one dilute, and another aromatic sulphuric acid. Six prescribed ipecac, five the syrup, and one the powder in an emetic dose, after the manner of Trousseau. Four gave aconite and two veratrum viride. Salt is recommended by seven, one of whom relies largely upon it because, in his opinion, sodium

chloride "is an excellent hæmostatic, if one may use the term in connection with a remedy which probably acts by modifying the quality of the blood. He administers the salt freely, either by the mouth in water, or in the food, or by the rectum, a dram of salt to an ounce of tepid water, or subcutaneously in the form of a normal salt solution. Four advise mild laxatives, but do not specify the particular laxative employed, except the advocate of salt, quoted above, who recommends phosphate of soda, because "of the physiological fact that the phosphate present holds the other salines in solution, thus making the common salt taken more effective." One only employs sprays to the larynx and trachea of solutions of iron, liquor ferri subsulphatis, ten to twenty minims to the ounce, or the tincture of the chloride of iron, from twenty to thirty minims to the ounce of water, repeated three or four times daily. One says he uses phenacetine internally, depending upon the cause of the hemorrhage, and after the attack, rest, light diet, and tincture of iron internally. Two speak of employing ligatures to the extremities close to the trunk during the attack, one specifying constrictions of the lower extremities to prevent the return-flow of blood to the lungs. One, who congratulates himself on having had but a limited experience in this line, says that in one case, with repeated slight hemorrhages, hæmoptysis ceased twice after atropine hypodermatically had produced dryness of the mouth. The advisability of light, unstimulating diet was dwelt upon by three.

In most instances the rationale of the treatment was not given, except, perhaps, by stating that opium or morphine was given to quiet cough, allay mental excitement or restlessness. By one the remedies were advised in accordance with the cause of the hæmoptysis and the condition of the arterial blood-pressure. The bare statement of therapeutic measures, which thus gave an appearance of pure empiricism, was probably due to the wording of my request, which asked for a statement of treatment, and said nothing concerning the reasons prompting them to any line of therapy.

It is apparent, however, that most of the various measures

and remedies mentioned are employed for the attainment of two great ends: either the constriction of pulmonary bloodvessels or the lessening of the blood-supply to the lungs by tranquillizing circulation in general or by diminishing blood-pressure in the aortic system.

It seems to me, however, that there are certain considerations which furnish a clear indication for treatment. Of course I speak only of hæmoptysis depending upon pulmonary tuberculosis, the one preponderating disease in which it is observed. In the early stage hemorrhage from the lungs is, in most instances, the result of active hyperæmia, and ceases so soon as the too active flow of blood to the lungs is corrected. When the hemorrhage arises from the ulceration or rupture of a pulmonary artery, either the opening must be closed by the contraction of the vascular coats or by the formation of a coagulum. Hence the administration of ergot, acetate of lead, gallic acid, and the like. But do these remedies accomplish the end sought? The effect of ergot is either denied altogether or considered doubtful by many clinicians. Openchowsky claims to have demonstrated by means of a manometer, introduced into the pulmonary arteries of lower animals, that drugs which affect blood-pressure within the aortic arterial system exert no effect upon the pulmonary arteries, except indirectly through their influence over aortic blood-pressure. Landois states that "contraction of small arteries, which causes an increase of blood-pressure in the systemic circulation, also raises the pressure in the pulmonic circuit, because more blood flows to the right side of the heart." Also, that the "vasomotor system has much less effect upon the pulmonary bloodvessels than upon those of the systemic circulation."

These considerations make it probable that ergot not only does not produce contraction of the pulmonary capillaries, but, through its constriction of the systemic arterioles, raises blood-pressure within the pulmonic system, and would theoretically aggravate, rather than ameliorate, hæmoptysis in the stage of excavation. The application of ice to the chest is stated by Landois and Winternitz to produce contraction of pulmonic

capillaries, and its employment is, of course, based on this theory. Its effect cannot be localized, and it may be applied indifferently to various parts of the chest, instead of nearly over the probable seat of hemorrhage. Indeed, Winternitz advocates the application of ice-bags to the supra-clavicular spaces. It seems to me that the surest method of producing contraction of the pulmonary bloodvessels is by lessening the amount of blood flowing through them, if, indeed, that be at all possible, and that this is best accomplished by dilatation of the systemic arterioles; in other words, bleed the patient into his own vessels. Furthermore, the retardation of the circulation favors the coagulation of the blood at the seat of hemorrhage. To meet this twofold indication arterial and cardiac depressants are employed. Aconite and veratrum viride produce arterial relaxation and slow the pulse-rate, but do this chiefly through their effect upon the myocardium. There is, therefore, certain danger of too greatly weakening the heart's action, and a drug which will produce vasomotor dilatation primarily and a subordinate degree of cardiac asthenia is preferable. Such a remedy is ipecac, and administered in doses sufficient to maintain nausea it is not only theoretically but empirically useful. The power of increasing the coagulability of the blood claimed for gallic acid is questionable, and the vasomotor constrictor effect of tannic acid, acetate of lead, and mineral acids is open to the same theoretical objection as is ergot.

In conclusion, permit me briefly to state the treatment I employ. For the hæmoptysis of active hyperæmia, I quiet the cough; preferably by phosphate of codein, by hypodermic injections or by the mouth. Prescribe syrup of ipecac in frequent doses until nausea is produced, and order an efficient but not severe aperient, preferably Hunyadi or Rubinat water. If the hemorrhage be within a cavity and profuse, I order the immediate injection, hypodermatically, of one-fiftieth or even one-twenty-fifth of a grain of sulphate of atropia. It is rarely my lot to reach the bedside during such an attack, but in cases in which profuse hæmoptysis is likely to recur, I leave orders

with the nurse to resort at once to this treatment. This dose promptly produces pronounced physiological effects, but is not dangerous, and the increase of the heart's rate and vigor is offset by the vasomotor paresis occasioned, which diverts the blood to the periphery. It may be urged also that the effect of a full dose of atropine corresponds to that of the application of heat to the surface of the body.

Schueller's experiments with animals showed that contraction of the internal vessels promptly follows the application of heat to the integument, as of the abdomen. It may be that the flushing of the skin caused by atropine acts like the application of heat, by producing contraction of internal, and, therefore, pulmonic vessels. If anything will promptly arrest pulmonary hemorrhage I believe it is atropine administered in this way. The subsequent treatment is all directed to the maintenance of the effect obtained by the atropine, and consists essentially of ipecac, codein, and laxatives in doses varying to suit the requirements of each case. It goes without saying that absolute physical and mental rest is insisted upon, and the diet is light and unstimulating. In a word, I believe that when our efforts have been directed to keeping the lungs quiet and the blood in the periphery of the body, we have done all that can be done for the relief of hæmoptysis; nature must do the rest.

THE TREATMENT OF HÆMOPTYSIS IN COLORADO SPRINGS.

Dr. S. E. Solly presented the report of a discussion at a meeting of the El Paso County Medical Society, April 8, 1896, Dr. P. F. Gildea, President, in the chair.

Dr. James A. Hart spoke as follows: During the development and progress of pulmonary tuberculosis there seems to be no symptom more dreaded by the patient or more annoying to the physician than the occurrence of a pulmonary hemorrhage. Although a common occurrence in such a place as ours, where there are so many cases of phthisis, it is looked upon by the laity as such a serious omen that the physician is frequently led to believe that the important thing to do is to check it at once. Hence the popular idea is to immediately administer such remedies as theoretically have this tendency, without considering the real action of the remedy or even the result of the hemorrhage if left to itself. The object of bringing this subject before the Society for discussion is to grant a request recently made by Dr. Walker, the President of the American Climatological Society, for some data as to how *we* treat pulmonary hemorrhages, simply desiring the details of our methods from a purely practical point of view. I think it will require but little time for each of us to express his own particular views upon the subject.

Personally, my experience has been fairly large with this class of patients, and I am free to say that I go to a case of hemorrhage with about the same feeling of temerity to-day as I did in my earlier experience. In fact, I think I feel less certainty than I originally did as to the result of treatment, owing to the fact of a loss of faith in the remedies formerly employed. I now feel that the treatment must be directed to the patient and not the disease.

It is unnecessary to mention the long list of drugs employed. Suffice it to say that I think I have tried them all and found them wanting. My usual custom is to give the cases of pulmonary hemorrhage a sufficient quantity of opium to allay cough, and leave the rest to Nature. If possible, I try to convince the patient that he is not in danger of death and assure him that the loss of blood is but a trifling matter, and by so doing relieve his mind, but this is much more of a

task than anything else in the management of these cases. Where these hemorrhages are persistent they are very discouraging to the patient and extremely annoying to the physician; they are apt to occur in cases that have improved and have become encouraged as to their recovery. I will simply refer to a recent case of this class coming under my observation. A well-appearing invalid with a patch of consolidation at the right apex was taken during the evening with a large hæmoptysis. I was called, and gave him immediately ¼ gr. morphine hypodermatically; the following day he had another hemorrhage, and for over a month he had almost daily bleedings. I used on this case every remedy of which I had heard, and regret to say that nothing seemed to produce any effect, the bleeding gradually ceased by gradually becoming less. The only drug upon which I place any reliance in these cases is opium, and that only for the effect upon the patient. I dread more the possibility of pneumonia following the hemorrhage than of any complication which may occur, and I believe that this complication is much less liable to occur if the patient is allowed to bleed and is encouraged to expectorate.

Regarding the tremendous hemorrhages from ruptured vessels into large cavities, I fear there is nothing to suggest. Such hemorrhages are liable to occur at any time in advanced cases and are invariably fatal.

I have simply made these few remarks for the purpose of introducing the subject and opening the discussion.

Dr. W. A. Campbell: Gentlemen, I am of the opinion that our bravest time in taking a case of pulmonary hemorrhage is when we first start out in the practice of medicine. The more experience we have with them, the less power we feel in being able to cope with and check the hemorrhage; such, at least, has been my experience. In hemorrhages from large vessels into cavities where there has been an erosion of a large vessel, I find we are almost powerless. Our patients will succumb quite often before we reach them, and their treatment will be a symptomatic one in most instances. I believe our first duty is to quiet our patients and quiet their fears. If the physician gets there before they die he can work upon this principle and give them morphine hypodermatically, which is the manner I should administer the remedy. The next thing is to check the depth of respirations in these profuse hemorrhages. I have found that strapping of the chest has given me some good results. The use of cold ice-bags, and so on, is as old as the hills, and I do not know that I have gotten any benefit from their use. There is another class of hemorrhages, that of small capillary bleedings. We have a great number of these; they often prove to be beneficial, and it is a question with me, as well as with the essayist, whether it is best to do much to try to check the hemorrhages, or leave them alone; whether or no

we do not in administering the remedies disturb the physical condition of the patient more than we do them good. I generally try to make a statement to them that the hemorrhage will be beneficial to them rather than detrimental, which I think we have good ground for believing. Many hemorrhages are induced by congestions in the lungs, and the giving of free capillary bleeding relieves this congestion and our patients come out from the hemorrhage better than they were before it occurred, provided pneumonia does not follow. I think this is our greatest danger from a majority of our capillary hemorrhages. I would most assuredly give morphine in the start to quiet the nervous system of my patients and get them to resting. If we stop here we would feel that we were not doing our patients justice, perhaps, and we will go on to other remedies and administer them, although we have no faith in them ourselves. Quite often, as routine practice, I give ¼ grain doses of opium in the stomach, combined with large doses of ergot and gallic acid. I think that our efforts should be toward the relief of what has caused the hemorrhage rather than trying to direct our treatment to the stopping of the hemorrhage itself. We all know that our patients may have repeated capillary hemorrhages and no bad results follow, hence the physician should not lose his head and be disturbed, and excite his patients. The time-honored custom of giving ergot has been discussed in our Society before. I am inclined to give it myself at times for want of a better remedy, for, outside of morphine, I have not been able to satisfy myself that we have anything better than ergot in large doses, but to be effectual at all you have to give it in sufficient doses to slow the action of the heart. I do not believe, Mr. President, that I think of anything more.

DR. W. F. MARTIN: The treatment I should follow would be summed up with three things—opium in the shape of morphine hypodermically, large mustard plasters externally over chest, back and front, and the internal use of some derivative, such as a free calomel purge; additionally, tight strapping of the chest with rubber plaster may be indicated.

DR. C. F. GARDINER: I am in complete accord with the essayist of the evening. I think giving ergot at all is a mistake, both theoretically and practically. My best results have come from the prompt hypodermic injection of morphine and atropine, and from a large mustard poultice applied over the region of the liver, a wrinkle I am indebted to Dr. J. T. Reed for. Morphine is valuable, in my experience, by acting first as a mental sedative, and, secondly, as a respiratory sedative.

DR. SOLLY: I agree with most of Dr. Hart's remarks on the subject; but he is, I think, too skeptical concerning remedies. The fact is we are in an unfortunate position about the treatment of hæmop-

tysis. Our practice has to be almost purely empirical, because we are ignorant of the physiological action of the pulmonary circulation and the direct influence of drugs upon it. The observations that have been made by physiologists are as yet incomplete. Dr. Bradford has made the best researches upon the subject. When the blood-pressure is raised in the aorta, is it also raised in the pulmonary artery? We do not know. The question is still unsettled. So I do not think we are in a position to decide about the relative value of remedies upon theoretical grounds.

As the facts are unknown we can only use our practical experience in the treatment of pulmonary hemorrhage.

We are all agreed upon the importance, in serious hæmoptysis, of rest in bed, rest to the chest by strapping, and rest to the system by opiates; these are the first essentials of treatment, to which may be added another, alluded to by previous speakers, that of quieting the nervous agitation of the patient. The nervous phenomena connected with hæmoptysis are very marked, particularly the mental. Next, we all probably rightly attach a certain secondary value to such treatment as stimulating applications over the liver, or mustard baths to the feet, and to purgation.

In estimating the effect of our remedies in the treatment of hæmoptysis we often do not know when we do good and when we do not, because most hemorrhages tend to stop of their own accord, without intervention of the physician and the application of remedies.

Cases of hæmoptysis may be divided broadly, as has been said, into those that are the result of congestion and capillary bleeding, and those which are from erosions of arteries. Each theoretically and practically requires a difference in treatment, and I believe our success largely depends on our diagnosis of these conditions.

It is quite likely that in Colorado there are a greater proportion of cases in which the hemorrhage is due to erosion of a large artery than is usual at sea-level, because our cavity cases live longer, and possibly the arteries around the cavities more frequently become aneurismal. Probably the reason for this is the more extensive fibrosis of the lung-tissue, a condition which results in the alternate compression and dilatation of these arteries by fibrous bands. Another reason may be that, in spite of advanced local disease, the general condition of the patient is often fairly good and he is able to be out and about up to the last, and so often exerts himself beyond what he would do in a lower climate. These considerations and personal observation have led me to think that hemorrhage from large vessels and large cavities is relatively more frequent in Colorado than elsewhere, though the general tendency of altitude, through lowering blood-pressure, is undoubtedly to diminish the frequency of hemorrhages, and this belief clinical statistics confirm.

The first great danger in profuse hemorrhage from a large vessel is the drowning out of the patient by the blood, and if the physician arrive early it is advisable to turn him in such a position that the blood can flow readily out of the mouth; the plan of laying him down on his back in bed is the worst possible position when he is freely bleeding.

As regards the application of ice to the heart, I am inclined to think that it is often beneficial. It seems to quiet the organ, and thus assist in checking the hemorrhage. I am skeptical about the value of astringents, such as tannic and gallic acids, nor have I been satisfied with the use of large doses of lead, as recommended by Williams.

My clinical experience has been favorable to the use of ergot in large doses, given subcutaneously, at intervals of four to six hours in the twenty-four. I have in mind several cases of very severe hemorrhages from large cavities, which were bleeding profusely until I used ergot subcutaneously, giving no other remedy. I believe a common cause of failure with ergot is its irregular and insufficient use and administration by the mouth. Given under the skin at regular intervals, and in full doses, I consider it of great efficacy in arresting hæmoptysis, particularly if this be due to an eroded vessel, and in the majority of cases I judge it superior to other remedies.

There are, however, some cases in which ergot is absolutely useless. What are the conditions accounting for this is mere speculation.

I also regard atropine as an extremely valuable remedy in serious cases, particularly in those in which ergot has proved a failure. But it must be given hypodermically in large doses, such as the $\frac{1}{50}$ of a grain. A small dose of atropine is not beneficial. Thus morphine is best given without the usual $\frac{1}{50}$ of atropine. It is stated that atropine in small doses raises the blood-pressure, while in large doses it lowers it. The reason that atropine is often successful in cases in which ergot is a failure may be because that in certain conditions lowering the blood-pressure, as by large doses of atropine, is essential to success, though in certain other conditions raising the pressure is no detriment or not sufficient to offset the other beneficial qualities of ergot.

Opium in some form should always be given, as well as other suitable remedies, when it is desired to arrest the hemorrhage and check cough. But there are cases of congestion in which it is unwise to do this.

The immediate danger of suffocation and the risk of a subsequent pneumonia are the most important considerations in the treatment of severe hæmoptysis.

Dr. Hutchins: I desire to state a point that my preceptor gave me in Ohio, that in regard to pulmonary hemorrhage he seemed to find that the wine of tar was a very valuable remedy.

DR. GILDEA: I think that where the hemorrhage is from an artery and the bronchial system filled, coughing ought to be encouraged and opium stopped after twenty-four hours; but in a capillary case the coughing should be modified by opium. I give ergot and derivatives.

Continuing, the President said: I will now ask each of the members present the following question, and desire that each answer separately: What three remedies would you take with you to a case of hemorrhage?

DR. MADDEN: I would take opium and ergot.

DR. CAMPBELL: I would take opium, ergot, and atropine.

DR. MARTIN: I would take opium, rubber plaster, and mustard.

DR. GARDINER: I would take opium, atropine, and mustard.

DR. SOLLY: I would take opium, ergot, and atropine.

DR. WILLIAMSON: I would take ergot, opium, and aconite.

DR. HUTCHINS: I would take opium, atropine, and mustard.

DR. MAFFET: I would take opium, ergot, and atropine.

DR. HART: I would take opium, and depend on finding hot water and mustard.

DR. MCCREERY: I would take ergot, opium, and atropine.

DR. DAY: I would take ergot, opium, and mustard.

DR. ROBINSON: I would take opium, ergot, and turpentine.

DR. CAMPBELL: I think we all have spoken of opium very freely to-night, but there is a danger of using a remedy of this kind to the detriment of our patient. We should be guarded as to the amount of opium we give, when we give it, and the number of times it is repeated. I formerly thought it was very detrimental to my patients to have them cough, but I rather encourage them now. I believe there is more danger in the retention of the blood in the capillary hemorrhage than there is in the cough to expel it. So we may get a wrong impression if it goes out that we indulge in opium so freely that we destroy that sensibility in the lung which promotes the throwing out of that which would be harmful to it to remain; however, I believe that we get better results by remedies given hypodermically than we possibly can by giving them by the stomach, and I wish to impress this upon anyone who would ask the question.

DR. HART: I think we make a great mistake if we try to check the bleeding. The bleeding will take care of itself in a majority of cases of pulmonary hemorrhage. I think my experience will bear me out in stating that hemorrhagic cases are less liable to hemorrhages here than at sea-level. I have abandoned the use of ergot in these cases. I cannot say that I have ever been sure of having derived any benefit from it.

GENERAL DISCUSSION.

Dr. W. D. Robinson: I have used calcium chloride with success, and find that given between the bleedings it is of advantage.

Another agent that I use is morphine, given to the degree of profound narcosis. I have given $\frac{1}{8}$ of a grain once in forty minutes until the patient is deeply under its effect. By stopping cough and local irritation we put the parts in splints, as it were, until firm healing of the bleeding point obtains. The morphine in full doses, by which the patient is kept practically in unbroken, sound slumber for eighteen to twenty-four hours, is especially efficient in cases of frequent recurrent bleeding. The drug that I have found most prompt and efficient in stopping a hemorrhage has been the hydrochlorate of hydrastium in $\frac{1}{4}$ grain hourly doses hypodermically.

Dr. Boardman Reed: Regarding the use of ergot in these cases, I have not found it of any value, and have even thought that in some cases the results were positively harmful by contracting the arterioles throughout the body generally, and thus raising the blood-pressure. The mineral astringents have done good service in my hands, especially the aromatic sulphuric acid and gallic acid. There can be no doubt that these drugs increase the coagulability of the blood and thus assist directly in lessening the tendency to hemorrhage. The opposite truth that alkalies given freely or for a long time lessen the coagulability of the blood is also capable of demonstration. Some of my own experiments and observations regarding the action of various drugs upon digestion have shown that when alkalies have been persisted with too long there has not only been a depression of the nerve-force and a diminution of the amount of acid in the gastric juice, but also in in some cases a tendency to hemorrhage, especially to bleeding from the lungs in tubercular cases.

Dr. Newton: I wish to say that bromide of potassium fills the indications in many of these cases, especially when used in conjunction with Dover's powders and an ice-bag to the chest. Each case must, of course, be managed according to the surroundings and the indications. I should think that Dr. Babcock's suggestion of large doses of atropine hypodermically is a very good one.

Dr. Hance: In a certain class of cases there is a totally different picture from what has been spoken of. There is high fever, from 103° to 104° F., very rapid pulse, and the general appearance of septic infection, probably due to a pneumonic process. The hemorrhages continue for some time, but the amount is not so very great. In these, digitalis in large doses and quinine have proven very useful. The subsequent prognosis in such cases is bad, for as a result of the pneumonic process new foci of disease are formed. In the general treat-

ment of hemorrhage I believe in absolute rest, morphine or codeine hypodermically, the tourniquet, calomel in small doses three times a day, with a saline in the morning to keep the bowels thoroughly open.

Dr. Walker: I am glad to hear Dr. Fisk speak of oil of erigeron. I have long depended upon its congener, oil of turpentine, in hemorrhages from mucous membranes, and am surprised at the few references to its use in text-book and journal articles. In hæmoptysis it is of special service, and this is not surprising when its hæmostatic properties are so well known, and its appearance in the expired air a few minutes after its administration by the mouth shows how quickly it reaches the scene of action. I usually administer it in five-minim capsules (sealed) every four to six hours. The use of the terebinthinates in hemorrhage was vaunted by John Hunter, he claiming that it was the only true styptic.

SERIOUS HEART LESIONS WITHOUT WELL-MARKED CONTINUOUS PHYSICAL SIGNS.

By HENRY L. ELSNER, M.D.,
SYRACUSE.

The clinician who depends entirely upon continuous physical signs for the recognition of all cardiac lesions will be likely to overlook numerous cases in which a thorough appreciation and interpretation of subjective symptoms with occasional and transitory objective manifestations would lead to a correct conclusion.

Associated with the study of the myocardium modern pathologists have unfolded a chapter which must necessarily impress the diagnostician with the great importance and the practical value of an early recognition of all cardiac lesions in which marked physical signs are for a long time absent or only occasionally present. It is no exaggeration to assert that many diagnosticians, and in some instances clinical teachers, have failed to diagnose existing and serious heart diseases, owing to the absence in such cases of murmurs and changed cardiac outlines. On the other hand, cases have been correctly diagnosed as being due to organic disorder, in which the diagnosis of so-called functional disease has been substituted, owing to the temporary or permanent disappearance of physical signs clearly indicating the true condition. There are conditions more important in cardiac diagnosis than the simple recognition of incompetent and stenosed valves, though many of our text-books have not succeeded in making that fact clear to the profession. Experience has demonstrated the great importance to the diagnostician, *for every purpose, in all heart diseases*, of understanding thoroughly the true condition of the heart-

muscle, and of determining with equal accuracy the degree of its functional activity. This knowledge cannot always be gained from a consideration of physical signs alone, for these may vary, or may be entirely absent where advanced disease exists.

The progress made during the past few years in the treatment of heart disorders by methods in which we, as a society, are particularly interested, has caused me to bring to your notice to-day the subject of "Serious Heart Lesions Without Well-defined Continuous Physical Signs," in the treatment of which I will attempt to picture conditions and present conclusions which have seemed to me to be of sufficient moment to deserve mention on this occasion.

In presenting the subject under consideration I find that it would draw this paper to undue length were I to give the full records of the cases which have prompted me in its preparation. I will therefore rehearse fully the history of but one case, and confine myself to deductions which seem to me justified after clinical observation and pathological examination of the others.

G. S., of Auburn, N. Y., aged forty-six years, merchant, consulted me September 16, 1891. He was well built, well nourished, with an unusually good muscular development, and a man of exemplary habits. He used tobacco moderately. His family history was negative. He had never been treated for constitutional syphilis, though when a young man, eighteen years of age, he said that he had had a little ulcer on his penis, which healed very readily in a few weeks, after which his attending physician told him that further treatment was unnecessary. Though constitutional symptoms had never been noticed, in the light of his subsequent history I have always suspected very strongly that he had syphilis, and treated him in accordance with such suspicion. He had never been seriously ill. In 1888 he had a slight attack of muscular rheumatism, for which he went to Mt. Clements, where he rested for a few weeks, took the baths, and returned home cured. During the eight years preceding his visit to me he had been considerably

annoyed after eating by a sense of discomfort in the region of the heart, which followed all hearty meals, whether resting or walking. He was much exercised by the fact that during the past few months this uncomfortable sensation was accompanied by an occasional shortness of breath, or, as he expressed himself, "superficial and unsatisfactory breathing." At first there was no pain in the left arm. If he walked to his place of business after eating, a distance of one-half mile, he had noticed in conjunction with the symptoms already mentioned that his breathing while walking, however slowly, became worse, more labored, and now there was more or less numbness of the left arm, forearm, and hand, while his left shoulder became painful until he rested for a few moments, when the pain and numbness completely disappeared. After this experience had been repeated a number of times he found that actual pain was substituted for the left-sided numbness, and at one time before I saw him he suddenly, after a moderate dinner, while walking to his store, was seized with symptoms of alarming angina. During this attack his physician, Dr. Cheesman, of Auburn, was called. He immediately recognized the fact that the patient was suffering from serious disease, though, on physical examination after the first severe attack, nothing abnormal could be found. When, on September 16, 1891, Mr. S. consulted me, his appearance was that of a perfectly healthy man. There was nothing in his color or breathing to excite suspicion of the existence of disease. His only complaint was of the discomfort after eating, and the increase of numbness and pain in the left arm during the preceding month, with an increasing sense of weight, causing a feeling of constriction in the upper thoracic regions. His breathing was becoming more and more labored whenever he made the attempt to walk after eating. His friends noticed a growing pallor during the continuance of the dyspnœa and pain; at other times his color was good. As time went on his breathing occasionally became slightly uncomfortable; if he did not walk after eating there was no numbness or pain in the left arm.

No amount of walking or exercise when the stomach was

empty at this time gave rise to dyspnœa or symptoms of angina. There was no headache, nor were there eye symptoms, œdema of the extremities, or puffiness of the face. There were no nervous symptoms, the patient slept well, his appetite was good, and his bowels regular. He passed the normal quantity of urine, and during my observation of him repeated examinations of the urine gave negative results. The anginous attacks were not followed by polyuria. Ophthalmoscopic examination was negative. Reflexes were normal. No hysterical symptoms.

Physical examination on September 16, 1891 :

Aside from a slight gastrectasia there were no abnormalities present. A careful examination of the heart showed its outlines to be normally located; the heart sounds were everywhere clear and distinct. There was no broadened area of aortic dulness. The pulse was 70, of good character, with arteries of normal resistance and tone.

Directing the patient to walk up hill for ten minutes and to return for re-examination, I found no change in the cardiac outlines, the pulse became more accelerated, 90, and feeble; while the heart-sounds were less distinct than before; the aortic sounds seemed distant, indistinct, or embryonic, as Nothnagel characterized them. There was no arhythmia, no complaint of fatigue or dyspnœa. As a result of this examination and a consideration of the previous history and symptoms I diagnosed myocardial degeneration, in all probability segmentary, of specific origin, and due to arteritis involving the coronaries or their branches.

In the course of a few weeks I had abundant opportunity to observe the patient after hearty meals, and to make careful physical examinations of the heart. During this time the symptoms were in no degree relieved by treatment. It was found that from October 1st to the 15th the left ventricle was dilated and reached one centimetre beyond the mammary line to the left; no murmur could be detected. At times the pulse showed marked arhythmia, and the aortic sounds were distant and indistinct. Urine continued normal. Anginous symp-

toms were increasing on exertion until it was determined to prescribe absolute rest for a short period in bed. After the rest, on the 6th of November, 1891, the dilatation had disappeared, heart-sounds were distinct and clear; he had no annoying symptoms during the period of his rest, however heartily he ate, and during the early days of November he considered himself much improved.

He was an unusually active business man, full of energy, with large interests, hence he soon gave attention to some of the details of his business, and at once experienced a return of his annoying symptoms on exercise after eating. It became evident that any considerable and continuous business worry or exertion of any kind was associated with an increase of symptoms, and then, in turn, with an increased area of cardiac dulness or dilatation. The dyspnœa and the pain in the left arm increased; about the middle of November these symptoms appeared independently of the taking of food. About this time he went to New York and consulted two of the leading diagnosticians of the metropolis, both of whom agreed that the disease was in all probability due to coronary disease and myocardial degeneration. A grave prognosis was given, and the patient remained in New York to rest, much dejected and discouraged.

He decided to consult two other physicians during his stay in New York, and was encouraged to do so by his friends and relatives, who could not reconcile themselves to the unfavorable prognosis which had been given. Accordingly he remained with the first of these consultants three or four weeks, after receiving the positive assurance that he had pseudo-angina, and that there was nothing organically wrong with the heart or its arteries. During this time he was treated dietetically and hydrotherapeutically. His symptoms unrelieved, having lost forty pounds, he decided to consult another authority, a man who stands high in the profession, an excellent and acute observer, who, after a minute examination, expressed the opinion that he had never seen angina pectoris due to coronary disease associated with myocardial degenera-

tion in a man as young as the patient, and gave a favorable prognosis, after concluding that he had simple dilatation of the stomach with pseudo-angina. Resorcin, bismuth, and cascara were prescribed, and the patient was sent home, to return to New York in three weeks, when it was confidently expected that he would be much relieved.

About one week later, on the 28th of March, 1892, I was hurriedly summoned to his bedside, where I met Dr. Cheesman, who told me of an alarming attack of angina pectoris which he had on the preceding Tuesday. We found the patient with an almost imperceptible arhythmic pulse, 120 per minute, at times more rapid; the cavities of the heart were dilated in all directions, the aortic sounds imperceptible, the remaining heart-sounds embryonic in character and indistinct. There were no murmurs. His extremities were cold, his face was ashen-colored, lips were blue; he was anxious and seemed to be in extremis. Urine was scanty—non-albuminous. He had no pain in the left arm during this attack. It did not seem to Dr. Cheesman or myself that the patient could rally from this condition; but on the following day, I believe, he went out for a ride. On the 5th of April, eight days after my visit, he had a similar attack, in which he died.

I have gone thus fully into the history of this case, because of the transitory character of the physical signs (always disappearing after prolonged rest), the unusually long period of discomfort associated with stomach symptoms, following the ingestion of food, preceding the first alarming attack, and the great variety of opinions which had been given by those who were consulted. We were unfortunate in not being able to obtain a post-mortem. From clinical experience with similar cases, in which we have been able to verify our diagnoses by post-mortem examination, there can be little argument against the assumption that there was involvement of the coronary arteries and the heart-muscle in the case reported.

The most serious objection to the diagnosis of myocardial degeneration from coronary disease, raised by one of the consultants, was the age of the patient. He held that angina

pectoris is not likely to occur until long after middle life, and that specific arteritis was out of the question, because of the failure of all antisyphilitic treatment to influence in any way the course of the disease. The latter objection may have been the stronger of the two, but I am fully satisfied that in cases where specific arteritis has existed for a considerable time undetected it is not at all uncommon to fail by our most improved methods when treatment is finally instituted to make any impression upon the diseased process, or influence materially the consecutive myocardial degeneration. While it is true that angina pectoris and myocarditis are conditions found in advanced life, it cannot be denied that these diseases with their underlying obliterating arteritis may exist during middle life, and clinicians have repeatedly established the truth of this assertion. I am fully satisfied that the majority of such cases are of syphilitic origin, or that heredity plays an important *rôle* in their causation. We are repeatedly reminded of the painful fact by our clinical experiences that young men have arterial disease in which we find them with arteries practically old and degenerated, with all of the evidences of senility. A very interesting case (Oestreich[1]) has come to my notice while writing this paper, in which a young man, thirty-two years of age, who had previously enjoyed perfect health, died on the night of his wedding with all of the symptoms of obstructed circulation and cardiac insufficiency, without symptoms of angina pectoris. He had never had the slightest premonition of the existence of disease.

The post-mortem showed beginning fibrosis of the ascending aorta. Upon an uneven and ulcerated sclerotic spot was found a thrombus which closed the opening of the right coronary artery, and from the side of this thrombus a prolongation had become detached which plugged the left coronary. This is a rare occurrence, but it is a case which proves the possibility of arterio-sclerosis in early life; still further, the possibility of occlusion of the right coronary (for the polyp must have covered the artery for a considerable time) without angina pectoris or subjective symptoms of any kind. The case establishes the

fact that complete occlusion of both coronaries leads to almost immediate death, for the patient lived only during a short period in which there was arhythmic heart-action, the heart stopping in diastole, the patient dying without a symptom of angina pectoris. Clinical experience corroborates the results of Porter's[2] experiments on the effect of mechanical closure of the coronary arteries of dogs. Complete closure of all the coronaries was always speedily followed by complete arrest of the heart-beat. The entire effect of coronary closuré is attributed to anæmia, which, in its development, must be followed ultimately by profound myocardial change.

In my own case the transitory dilatation of the ventricles deserves more than passing notice. It has been my experience to note a similar behavior in other cases in which the dilatation followed strain in a heart already the seat of fragmentation or segmentary myocardial degeneration. In some of these cases there was an associated valvular lesion, in others arterial disease. Recession of the dilatation followed rest and rational treatment. Auriculo-ventricular murmurs are occasionally heard during the period of extreme dilatation; as this disappears murmurs are no longer audible or they are much modified, systole is stronger, and compensatory changes are plainly manifest. One of the main objects in presenting the history of my case was to emphasize the persistence during so many years of the direct association of anginous symptoms with the ingestion of food and the accompanying distention of the stomach. This was misleading (though frequently encountered in this class of cases), and seemed to many to be evidence sufficient to justify the diagnosis of pseudo-angina, a condition which is rarely met, and a diagnosis which ought never to be made until all possibility of the existence of true angina with its positive pathogenic factor has been excluded.

In connection with the subject of transitory dilatation of the ventricles I wish to call attention to cases belonging to a class which are quite common, but which are not often recognized in their incipiency. I refer to alcoholic myocarditis (Aufrecht).[3]

The disease makes gradual progress, but often during the early stage, if the patient is carefully examined, a slightly increased area of cardiac dulness is found with, as a rule, clear and normal heart-sounds, and occasional arhythmia. Only rarely do we hear a faint systolic murmur. These physical signs are not persistent, but during the early period of the disease are materially influenced by exercise and various other causes which increase heart-action. We not infrequently find these patients coming to the clinic or to the hospital with dyspnœa, slight œdema of the ankles, cough, indigestion, and other evidences of stasis.

After a period of rest with appropriate treatment, we find the patient comfortable, the symptoms of weak heart have disappeared, and with the disappearance of the subjective symptoms the physical signs have vanished, the heart has returned to its normal size. The successful treatment of these cases must necessarily include total abstinence from the use of all spirits. These same patients, if they continue to indulge in the free use of spirits, are soon returned to us with all of the symptoms of advanced myocarditis, general dropsy, and every other evidence of a poorly compensated heart, and in many cases associated cirrhosis of the liver. We see fewer of these cases in this country than are found in Munich and other cities on the Continent, where beer is excessively used, but I have learned to recognize a variety of alcoholic myocarditis, the clinical picture of which answers very closely to that described by Böllinger[4] and others.

In one case which I recently saw there was associated alcoholic neuritis. The patient recovered from the latter complication, but finally died with all the symptoms of dilated and enfeebled heart. Another clinical fact in connection with these cases is that these patients offer very little resistance to acute infection, and in a majority of cases readily succumb, a fact which is particularly true of pneumonia and other acute respiratory disease.

During the past two years my attention has been called to both permanent and transitory dilatation and hypertrophy of

the heart following severe strain, undue muscular exertion, and prolonged worry. It is of the utmost importance in these cases to determine whether there was pre-existing disease of the heart or its muscle. In the majority of these cases I think the history will prove that the heart was not normal before the strain. This has been established in all of my cases in which the dilatation and hypertrophy continued permanently unless the strain was continuous and the patient had labored under it for a considerable period. Sée[5] and Rieder[6] in support of this position make the observation that in France the country letter-carriers who walk all day suffer no ill effects from their long-continued and at times laborious marches, probably because the normal heart, like other muscles, accommodates itself to the work. Rieder (*loc. cit.*) asserts that with a healthy condition of the heart it is exceptional and exceedingly rare to find cardiac insufficiency and dilatation with consecutive hypertrophy following severe bodily exercise. Besides these authorities, Spillman,[7] Bernheim,[8] and Thurn[9] make the more positive statement that the normal heart never tires, that in those who are perfectly healthy in spite of exhausting effort there is no typical cardiac insufficiency. During the past winter it has seemed to me that many of us who have been forced to suffer the hardships of country roads and have escaped without a scar furnish living examples of the truth of the statement just made. I am reminded of one of my experiences during January of this year, in which, late at night, I was caught in the country at a considerable distance from the station, in snow-drifts through which we could not drive. Already fatigued, with a satchel in one hand and a lantern in the other, I commenced to break my way through enormous snow-banks. It seemed to me at times that I must perish from sheer exhaustion. At times I felt that my heart was doing double duty. After persistent and continued effort I reached my destination. Every artery within me was revolting, and it seemed as if my heart were making active effort to leap from its resting place. Such experiences are associated with more tear than wear, but the heart received no permanent injury, and, much to my surprise, after I had rested in the car,

became serene and quiet as before. This would not have been the result had one with either incipient arterial disease, myocardial degeneration, valvular lesions, or hypertrophy associated with nephritis been exposed to such a hardship.

With such complications we are not surprised to find permanent injury following strain, and rapid advancement of all the symptoms referable to the heart, and continuous physical signs. Prolonged muscular exertion and consequent strain are in all probability important predisposing factors in the causation of degenerative heart and arterial disease, and if those cases in which there are but occasional or transitory physical signs to lead us are subjected to such insult the symptoms soon become continuous and characteristic of fragmentation of the myocardium. In the current number of the *American Journal of the Medical Sciences*, Weber,[10] in a foot-note to his article on "Syphilis and Etiology of Atheroma," makes the statement that "though moderate functional activity and mechanical movements must be regarded as natural stimulants tending to the proper nutrition of the tissues, excessive functional activity and mechanical strain may probably cause malnutrition and irritation, giving rise to chronic degenerative and inflammatory changes."

There are two classes of cases to which I wish to call your attention. In the first class we find cases in which for days at a time there exist with dilatation marked arhythmia, tachycardia, and alarming intermission of the pulse, with delirium cordis, dyspnœa and all of the other evidences of an organ ready to surrender, with secondary involvement of lung and kidney, but in which, after persistent effort, there has, for a time at least, been a return to apparent health, the heart acting normally, but little dilatation remaining. Some of these cases I have followed for many years, during which we have battled vigorously against repeated attacks such as those to which I have called attention, and often the life of the patient has been prolonged, much to our surprise.

In the second class of cases we have for a limited period symptoms of failing heart strength, as shown by increasing dyspnœa on exertion. There are no cardiac murmurs in most

of these cases, but persistent dilatation, with little or no hypertrophy. The condition which is surprising is that the pulse remains regular almost to the end, though there is marked tachycardia. The heart shows no tendency to mend, sudden death follows, as a rule, after the acute symptoms have persisted for a few days or weeks. As the symptoms grow more alarming we have all the evidences of portal and renal stasis. In these cases there is no pre-existing emphysema. In both varieties there was found marked myocardial change on macroscopic, more particularly microscopic examination, and until I had studied the valuable monograph of Hampeln[11] and the results of Radasewsky's[12] observations much which was unfolded at the post-mortem was as poorly interpreted as were the clinical features before death.

We had, in our pathological examination, given but little study to the appearance of the auricles, the ventricles having received most of our attention. Arhythmia was considered a necessary symptom of fibroid or degenerated heart. Hampeln (*loc. cit.*) proved that a regular pulse need not exclude the existence of advanced myocarditis. In five cases which he followed the pulse remained regular to the end, the post-mortem giving marked evidence of segmentary ventricular degeneration. During the past two years I have seen two cases in which I had opportunity to observe the patients to the end. The first was a man whom I left with a regular pulse without a sign of impending danger ten minutes before his death. The post-mortem revealed a thin ventricle with partial rupture, the microscope gave evidence of advanced ventricular fibroid degeneration. The second case was one of complete rupture with preceding transitory physical signs, in which there were microscopic evidences of degenerated ventricular walls and advanced coronary disease. In fact, these cases of ventricular disease are the more serious, and, with the symptoms mentioned, give a more unfavorable prognosis than do those which I have described under the first class. It is upon these that a flood of light has been thrown by the painstaking observations of Radasewsky (*loc. cit.*), results to which I have found but one American writer refer, Babcock,[13] in spite of the fact that they are

of the greatest import, making a more exact localization of the lesion in the heart possible during the life of the patient. It must be assumed that Romberg and Krehl[14] were correct in their assumption that automatic and rhythmic action of the heart takes its origin in the muscular fibres and not in the cardiac ganglia, and that the starting point of the primary impulse to contraction is in the walls of the auricles near the opening of the large veins.

Radasewsky's (*loc. cit.*) conclusions seem to prove that the marked irregularity of the heart in chronic myocarditis is due to a localized involvement of the auricles, and cannot be explained by changes found in the ventricles. Thus the localization and the extent of tissue-change is made possible by a consideration of the character of the pulse and the behavior of the heart-muscle. The degeneration of the ventricles usually associated, as I have remarked, with a regular, but as the process advances an increasingly feeble pulse, gives a most unfavorable prognosis, because of the greater strain to which these are subjected.

In the consideration of valvular diseases, with or without continuous physical signs, we have learned that the condition of the myocardium is of the utmost importance and demands the closest attention.

The changed heart-muscle ofttimes presents a complication entirely independent of the accompanying valvular lesions Romberg),[15] and becomes important, not only because of the extent of its involvement and of the changes produced, but owing to the nature of such changes the prognosis is materially affected thereby. We are likely to have the clinical evidences of heart fatigue with either diseased coronaries, connective-tissue overgrowth or parenchymatous changes in these cases.

The most recent investigations (Banti[16]) bearing upon the anatomical causes of changed and faulty compensation in valvular lesions prove the direct association of these insufficiencies with changes in the heart-muscle consequent upon lesions in the coronary vessels. In those cases in which the valvular diseases of the aorta are due to fibrosis—and the majority of these are—it has been found that the branches of the coro-

naries as well as the aorta itself are the seat of periarteritis and endarteritis. In consequence of these changes we find circumscribed degeneration of the muscular structure of the heart, even necrosis and ultimate foci of new cicatricial tissue.

With mitral lesions, which are more likely to be of inflammatory origin, the starting point of the retrograde process is in the coronary veins. The right ventricle is unable to hypertrophy sufficiently, and its muscle is weak, without resistance. There is obstruction not only in the venæ cavæ in these cases, but the coronary veins are equally involved in the process; these are dilated with thickened walls. Banti's (*loc. cit.*) suggestions are rational, and, in the light of anatomical observation and clinical experience, justify us in considering that with faulty compensation and aortic lesions there is an "arterial," with mitral lesions, a "venous cirrhosis" of the heart. Increasing arhythmia, reduced heart strength and progressive ventricular dilatation are accompanied with more audible evidences of auriculo-ventricular incompetence and all of the ordinary symptoms of marked faulty compensation. This alarming condition can in many cases be postponed, though it cannot be indefinitely averted, by an appreciation of the existing complication. The condition must be recognized, and this can only be done if we appreciate the fact that the myocardium is prone to undergo degenerative change with all valvular lesions, whether associated with dilatation or hypertrophy, or with both; hence we must be on the alert for the earliest manifestations of such changes. With valvular lesions the first and slightest increase of dyspnœa associated with either persistent or transitory arhythmia, the slightest increase of physical signs after exertion, and with these symptoms an increasing area of cardiac dulness, whether permanent or transitory, must lead to the conclusion that the myocardium is becoming insufficient, undergoing, in all probability, degenerative or inflammatory change requiring rest and active treatment.

When valvular lesions are associated with acute infectious processes it is not at all uncommon to find clinical and pathological evidences of acute exacerbations of chronic myocarditis; indeed, in some of these cases the evidences of the acute disease

of the heart-muscle overshadow entirely those of the valvular lesion.

Stokes,[17] in 1855, made the statement that we find in the muscle the key to the pathology of the heart, and his words are worth recalling at this time. He held that, whatever the cardiac affection, the symptoms depend mainly upon the strength or weakness, the irritability or paralysis, the normal or abnormal condition of the heart-muscle. The observations of Lænnec made many years ago, which prompted the statement that valvular lesions have but little influence on the general condition of the patient so long as the heart-muscle remains healthy, are equally true to-day, while the same can be proven of many of the other heart diseases in which the physical signs are variable and at times intermittent.

The time allotted for the presentation of this paper has already been exceeded, and yet numerous anomalies of the heart which during their incipiency and even at their maturity are associated with transitory physical signs have not been considered. To these the writer will refer at another time. But hurriedly, in passing, attention must be directed to the variability of the physical signs referable to the heart in many forms of anæmia, either due to constitutional disturbances or local asphyxia from coronary disease, and the rapid disappearance of these under favorable environment and treatment.

The paper would be incomplete without reference to those cases of paroxysmal tachycardia in which the tachycardia is not a symptom, but is supposed to be an essential disease, Loeser,[18] Bouveret,[19] and Martius.[20] The history of these cases is peculiar. There are sudden attacks of rapid heart action, with a small, thready, easily compressed pulse, and no previous history or physical signs of heart disease. In the majority of cases no cause for the attack can be discovered. The patient is seized without warning, or awakens from a sound sleep to experience all of the annoyances of the disease. I have seen patients in these attacks, with pulse reaching far beyond 200 per minute, at the same time found it regular with diffuse but feeble cardiac impulse, and ultimately, after repeated attacks, there was increase of cardiac dulness due to

dilatation, which disappeared with the disappearance of the symptoms (Bristowe).[21]

Dilatation is not a necessary accompaniment of paroxysmal tachycardia, and when it follows is of secondary origin. Quoting Loeser (*loc. cit.*), we find in one case that the tachycardic attacks were at one time associated with dilatation; on another occasion none could be detected. Bouveret (*loc. cit.*) mentions cases without dilatation, while Fritz[22] observed two patients during a period of three years before it occurred.

In one case the pulse varied between 180 and 224, while in the other there was no increase of cardiac dulness with a pulse of 204. Quincke and Hochhaus[23] have had similar experiences. These cases of paroxysmal tachycardia must not be confounded with hysterical palpitation. In the latter there are always accompanying symptoms which, associated with the fear of impending death, brand the disease, while in the former we not infrequently find the patient without fear, and often but little annoyed by the rapid action of the heart.

Finally, it may be positively asserted that murmurs have been heard occasionally when no organic change was found after death. It can be as confidently stated that organic change was often present when no murmur was audible. Such a case I recently saw in which there was ulcerative endocarditis, the deposit was slight on the endocardium between the curtains of the mitral valve and on the free endocardium, embolic processes were present in distant parts, making the diagnosis possible before death. Murmurs disappear for a time, as Fothergill[24] says, "in a perplexing manner." "Even the aortic regurgitant, the most persistent of all, has been known to be absent for distinct periods," W. T. Gairdner.[25] Mitral regurgitant murmurs have vanished in cases where the dilated left ventricle has been relieved, and the curtains of the valve consequently become sufficient to close the ostium.

Sufficient has been submitted, I trust, to call the attention of the profession anew to cases of serious heart lessions without marked continuous physical signs, in which an early diagnosis can often be made to the greater benefit of the patient and the satisfaction of the physician.

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DISCUSSION.

Dr. R. H. Babcock: I desire to thank Dr. Elsner for his interesting paper, which is full of suggestions and opens up a vast field of discussion. One point I wish to make is that for the most part practitioners are inclined to depend too much upon a single method, and that is auscultation in the examination of the heart, whereas percussion often yields more valuable information than does auscultation. In this connection permit me to describe two cases, both females, which illustrate this point. One of them a married woman, aged thirty-two years, was referred to me because of cardiac dilatation. Upon the first examination she was very nervous, and the heart beat from 120 to 130 times a minute, and auscultatory percussion showed relative cardiac dulness to extend fully three inches to the left of the left sternal border. As I did not wish to express an opinion at that time, she was told to return the next day, which she did. Her nervousness of the day before and tachycardia had largely disappeared,

and auscultatory percussion showed the left border of the heart situated two and one-half inches from the sternum. Here was a case in which, owing to tachycardia, the left ventricle was unable adequately to empty itself, and a condition of temporary dilatation resulted. Had I found upon the first examination that relative dulness extended only two and one-half inches from the sternum I should have been inclined to doubt if she ever suffered from cardiac dilatation, but the difference observed on the two days, under differing conditions, convinced me that her physician was right in having diagnosticated cardiac dilatation. The second case was that of an older lady, aged fifty-five years, who had resided for a long time on the table-land of Mexico at an altitude of seven thousand feet, and who suffered on exertion while there from symptoms that led me to suspect a condition of grave cardiac dilatation at that altitude. My examination did not reveal any marked increase of præcordial dulness, and yet I am sure this patient was subject, under favoring conditions, to temporary over-distention of the heart cavities with consequent circulatory embarrassment.

The first case which Dr. Elsner has narrated is very instructive. I think it may be said that when there is a history of syphilis and there are symptoms pointing to heart disease, although without physical signs of the same, it is probable that the heart has become diseased as a result of the specific infection.

One of the earliest indications of circulatory embarrassment to which I attach great importance is turgescence of the superficial veins. In the young and in healthy young adults the veins of the extremities should not be noticeably distended as is the case in elderly people When, therefore, I observe such venous turgidity I am often suspicious of the condition of the heart muscle even in the absence of positive signs of disease

I believe we are living in an age calculated to develop cardiac disease. People live under high-pressure, and out West particularly everybody is "hustling." Much damage may be done, for instance, by the elevated roads, through people hurrying up the stairs to catch trains. Taking life as we see it in Chicago, all things seem to favor heart strain.

With regard to the bicycle, I desire to say that I regard it as a valuable but dangerous form of cardiac therapeutics. Adults of forty-five years of age or over should not ride without first submitting to an examination of the heart. A year ago I signed the death certificate of a man, aged forty-seven years, who had pronounced arterio-sclerosis, a greatly enlarged and dilated heart, and chronic interstitial nephritis, and who, I believe, died as a result of injury to his heart done by a century run four years before, at the age of forty-three years. There was a distinct history of cardiac overstrain at that time. I now have under my care a man, aged fifty-eight years, with marked arterio-

sclerosis, and attendant changes of heart and kidneys, who last year rode his wheel with benefit, as he thought, but I believe with indiscretion and injury that have contributed to his present cardiac asthenia.

With regard to such severe physical exertion as that described by Dr. Elsner in his own case, it would be well to remember that many a heathy man has found to his cost that in making such efforts he has been banking on resources he did not possess. No one can tell that after forty years of age he may not have developed a small atheromatous patch in the aorta which may occasion serious mischief if subjected to unusual strain.

Dr. J. Madison Taylor: The paper of Dr. Elsner interests me particularly in connection with the subject of the endurance of the heart under strain. The capacity of the human heart to endure long and severe strain is a subject which merits more thorough study than it seems to me has been given it. There is a popular impression that severe athletic exercise frequently results in injuries to the heart. Indeed, so admirable an authority as Dr. Benjamin Ward Richardson has made a statement to the effect that he "can scarcely over-rate the dangers of these fierce, competitive exercises, and that the state of perfection thus reached is purely an artificial one and sustainable only for a brief period," and that there invariably follows this artificial system of training an inevitable decadence in the involuntary muscles, especially the heart, which remains out of due proportion in vigor, and that this leads to serious harm.

I took this matter up and made a pretty careful study of it on one occasion, estimating "the effect of physical exercise upon length of life," and was enabled to examine many old athletes, many of them professors, who had attained very considerable age. It is my observation that those persons who thoroughly developed their bodies to the point of undergoing the severest kind of strain in athletic competition, provided their organs were sound originally, were benefited rather than harmed thereby. It becomes a fact with many that a person would not damage their circulation, especially their heart, by competing in such exercises as they were adequately trained to compete in, provided their organs were originally sound. Of course, there are a great many symptoms arising among those who bear severe physical strains that have to do with disturbance of the heart and conditions depending thereon, but the heart itself maintains its integrity throughout their period of training with wonderful satisfaction. The first thing that is particularly interesting in connection with Dr. Elsner's paper is the fact, as it seems to me, that the old athlete, who has borne the burden and heat of the day, is not only no worse for his severe exercise, but distinctly better, and that this continues to the end of a long and useful life. I cheerfully admit that there are many and glaring examples of disrepair among these old warriors, more particularly in connection with their hearts, that

we must always be clear if we judge the matter fairly upon those many complicating conditions which tend to bring this about, such as, first and foremost, original integrity of the organ. Secondly, adequate development of it as adjusted to other organs. Thirdly, that the training it received was always sufficiently deliberate and careful. Fourthly, that it was adjusted to the particular forms of competition it was to undergo. Fifthly, that there was no complicating condition or form of intercurrent disease from which the individual had failed to recover. Sixthly, that there was no injury in the form of dissipa. tion or excess which could be directly blamed for any evil results.

I am convinced that a child starting out with a vigorous heart and receiving, either by accident or design, systematic training by careful strengthening processes open-air exercise, and regulated measures of whatsoever kind, will gradually acquire a degree of strength of the heart and allied organs of blood-making and blood-eliminating organs as will make that child himself, as he grows to old age, not only a more enduring individual, but just those things and those states will stand him in good stead as he advances in the ordinary cares of a busy life, and tide him over the strains as they come upon him, helping most largely to bring him to the end more active and vigorous by far for the life he has led. This I think to be true both in girls and boys, and the importance among girls is gravely underestimated, for upon them the burden falls of double circulation during the period of gestation, and for them it is necessary that extreme provision should be made for adequate development.

We Americans are constantly placing ourselves under the double strain of trying to do too much in too short a space of time. Secondly, under the existing conditions of false stimulation. Thirdly, endeavoring to sustain what we denominate physical training along with and in addition to a number of other strains, which make the aggregate ofttimes seriously harmful.

In the repair of damaged conditions of the heart nothing is of greater importance than that mental and nervous rest should more than supplement the usually enforced physical rest. In estimating the damage done to enfeebled hearts, we must not lose sight of the fact that where physical exercises have been blamed strains have been of a kind where fictitious and emotional stimuli have been applied and continued. The bicycle is becoming a very considerable factor in our life, and we are likely to find a number of injurious consequences due to the use of the wheel. It has been well likened to a thoroughly ignorant person buying a well-bred horse, and simply because he happens to possess the animal, and has had a few lessons in riding or driving, it may be an ambling, amiable pace, immediately uses this swift racer as if he knew how to manage a real horse, a gift which is vouchsafed to a few. He uses this race-horse in a way and

to a degree which is utterly incompatible with his knowledge. Thus he runs particular risks of destruction, or what is a matter of serious danger, the strain due to keeping the instrument in long sustained motion, which is readily blamed on overdoing, to the very great hurt of the individual.

Persons who have taken almost no exercise throughout the length of their life, whose organs have had no particular or systematic development, begin to use suddenly so simple an instrument as the wheel, and, like a child with a new toy, they use it day after day, in season and out, and, I was going to say, use it in condition and out of condition, but they very rarely are in condition, and yet, forsooth, they must go on nd on in the process, keeping up with their friend who may be in a more or less good condition, and thus bringing about, very probably, serious consequences to themselves. It is an axiom that if a person has once developed himself fairly well and remained organically sound, that it requires very little effort to get back into condition and enable him to stand considerable physical strain. I have seen this in a great number of instances and met it in practice a great many times. To quote myself as a fair illustration, I took considerable pains to get myself developed in my youth and to maintain the condition until the graver affairs of life forebade my continuing. Now, however, when I secure a brief vacation, such is the development of my various organs and limbs that it requires very little time to get back into a condition which enables me to hold my own in any ordinary outing strain. This is true, not only of those who are on the hither side of life, but is especially applicable to those who are upon the downward slope of the hill. I have seen this matter tested time and again, and in the instance of some very old gentlemen. It has been assumed that it is impossible to increase the muscular development in size and power after late middle life, but in the instance I quoted in the paper referred to, a certain Major Knox Holmes, a veteran cyclist of England, in his eighty-third year, acted as one of a tandem military bicycle team on a trip of one hundred miles, and came in ahead of the rest. In twelve weeks, under training, he developed in a striking manner the size and power of the muscles of his legs. What is true of the voluntary muscles may be estimated as true of the involuntary muscles, hence the heart; but of course both of these need to be of a certain quality, which, while largely inherent, is to a greater degree acquired, and which is certainly better for having been steadily and carefully developed.

Dr. Smith: The feeble aortic sound deserves mention in connection with the subject under consideration. In many of these cases we find great difficulty in getting a distinct second aortic sound. I am interested in this class of cases, and believe that we ofttimes overlook serious heart lesions where physical signs are absent or only

occasionally present. The absence of distinct aortic sounds has often led me to make a thorough examination including everything which the case offered, and I have learned to recognize the fact that feeble, distinct aortic sounds are characteristic of degenerative change, not only in the aorta and coronary, but of the heart muscle itself.

Dr. Elsner: The indistinct aortic sounds are mentioned in connection with the clinical history of my case. It is better to speak of these as "embryonic sounds," as Nothnagel has characterized them. I am pleased to have Dr. Smith refer to this absence of accentuation. Feeble heart sounds over the aortic area are always ominous.

Referring to Dr. Taylor's remarks, I agree with him fully. It has been my experience that a muscle which hypertrophies as the result of a heathy stimulus is more likely to endure than one which results from nature's effort to compensate for an existing fault as a diseased valve or distant obstruction, etc.

Dr. Babcock: It seems to me that the difference in the quality of hypertrophy consists not in any essential difference in the nature of the hypertrophy, but in the fact that in the heathy heart under severe and prolonged exercise there is no pathological obstacle to be overcome, but there is a heathy stimulation of the myocardium. Whereas, when in pathological conditions hypertrophy takes place it is established for the express purpose of overcoming an obstacle to the circulation, either within or without the heart. This obstacle is perpetual, and there at length arrives a time when the hypertrophy is no longer adequate to the overcoming of this obstacle, and dilatation takes place.

Dr. Quimby: I cannot forbear entering a protest against the statement that there are different kinds of cardiac hypertrophy, pathologically or physiologically, and to insist that all cardiac hypertrophy is *physiological* and *not pathological,* for I am sure I have seen many evil results in practice follow the contrary belief. It is too often forgotten that cardiac action and hypertrophy are primarily questions of pure physics. A heart hypertrophies in proportion to the amount of work it is called upon to do, regardless of what that work may be. Some of the speakers have cited conditions which they define as "obstructions," and imply, if they do not directly state, that they produce a peculiar form of hypertrophy. Yet mechanically an aortic stenosis is no more of an obstruction than tightened arteries of Bright's. It may be more persistent, but it affords no reason for the assumption that the resultant hypertrophy presents any peculiar character. If an "obstruction" *per se* has any peculiar effect on the character of the muscular growth then the hypertrophy of aortic stenosis should differ from that of regurgitation, and with the double lesion there should be a mixed form. Still further, I cannot admit that these so-called pathological hypertrophies are "more prone to

degeneration." Indeed, I believe the opposite to be the truth, for we well know that it is never possible to produce by simple physiological muscular action anything like the degree of cardiac hypertrophy that frequently attends aortic obstruction or to maintain such hypertrophy. That the pathological hypertrophies *do* more frequently go on to degeneration is true. But this is due not to their *character*, but to the continuance of the strain which causes them, or rather to its augmentation to a point beyond which nutrient is inadequate to produce corresponding hypertrophy. Cardiac degeneration does not occur because of the *character* of the hypertrophied muscle, but from *increase* of strain or *decrease* of muscular nutrition. I wish to lay special stress upon this point, because I believe many errors in treatment are due to failure to appreciate this relation. Time and again I have seen young internes give digitalis to a flagging heart in cases of Bright's with œdema of the feet, with the result of only increasing the œdema; I have seen these same œdemas clear up under glonoin for a few days, and the heart, thus given a short rest, again take up its work with success for weeks or months. *Relief of strain*, when that is possible, *will prevent degeneration* of the heart which is *hypertrophied from disease* just as certainly as *rest* will do it for the *hypertrophy* of *physical exertion.*

Dr. Munro: I wish the surgeons could hear this discussion. All men have occasionally had patients who stand moderately severe operations poorly, and then in a few days go to pieces altogether. There is no evidence that the kidneys are not in good shape, or that there is any form of sepsis, nevertheless they do not rally after the operation in the way that a patient suffering from temporary shock rallies; their hearts never seem to "catch up." They are the most confounding cases that any of us have.

Routine examination before operation does not show that these patients have serious cardiac lesions. More searching and careful inspection would probably show a slight dilatation or lack of compensation to account for the subsequent break-down—defects much less apparent, but correspondingly more serious, perhaps, than the lesions, causing loud murmurs when the question of operation is to be considered.

Dr. Elsner: Clinical experience must be our guide as well as pathologic research, and, I repeat, that both have led me to emphasize the fact already stated, that a heart-muscle which has hypertrophied as the result of valvular lesion is one which may go on doing its work for a long time, possibly compensation may continue indefinitely, but it is a myocardium which one always fears. Any extra work or strain added to such a heart will be likely to cause serious mischief, owing to degenerative change.

CONGENITAL NARROWING OF THE MITRAL ORIFICES AS A CAUSE OF DWARFED LIVES AND IRRITABLE HEART.

By ROLAND G. CURTIN A.M., M.D., Ph.D.,
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Mr. President and Gentlemen: I wish to bring to your notice a condition of the heart which I think has hitherto been undescribed. The number of cases that I have seen would indicate that it is not a very rare condition, as I have seen about one hundred sufficiently well marked to be recognized. These have been culled from over thirty thousand distinctly medical patients seen in a large dispensary and hospital service, as well as in a private and consulting practice, which includes many heart cases.

While I was serving as Chief of the Medical Dispensary of the University of Pennsylvania, in 1877, a young woman presented herself with blued lips and extremities, and was regarded as a case of vasomotor and trophic affection of the fingers. She had the murmur and physical signs, to be hereafter described, in a marked degree.[1]

One year later, about Christmas, 1878, three boys presented themselves in a single week at the same dispensary with similar physical signs and symptoms. They were from a prominent city store. They had been acting in the capacity of "cash boys," and the unusual activity, running up stairs, etc., consequent upon the extra hours incident to the holiday shop-

[1] Case reported in the October number of the American Journal of the Medical Sciences, for 1878, by Dr. C. K. Mills.

ping, caused them to break down and apply for treatment. In all of them the symptoms were rapid, irritable hearts, suffused faces, shortness of breath, a murmur over the heart, and loss of strength and appetite.

On inquiry, I found that they had previously lived very quiet lives, without active exercise. They were easily fatigued, unable to keep up sustained action, and even in early childhood had been unable to cope with their fellows in active play. They had lived sedentary lives and took only very little exercise.

These cases aroused my curiosity. I have been studying their counterparts with increased interest ever since. I now give you the results of my work. I will read the histories of a few of the cases which best illustrate the early history, symptoms, and physical signs.

CASE I. *A marked case of dwarfed life without irritable heart.*—E. V., seven years old. Never, from his earliest childhood, had he played with or like other boys. He never had any marked symptoms until he was fourteen years old. Since then he has grown rapidly. He has had no disease except the usual diseases of childhood. At seventeen he had measles and lung complication.

He is now in college. I asked him whether he played football. He answered, "That is too rough." I then inquired whether he played base-ball. He said, "That is too active." Next I asked whether he played lawn-tennis, and he replied, "That is too rapid for me." So I finally inquired what he did for amusement. He said, "I play the piano, read, do fancy needlework, and write poetry." He graduated from college, read law, practised a year and a half, and finally took up office literary work, in which he is eminently successful.

He complains of a pain as if a nail were driven into the sternum opposite the cartilages of the second rib. He complains also of dizziness, and at times loss of memory, and has what is called a "cramped brain," especially on dull days. His growth is good, but he is poorly developed and his muscles are flabby. A marked pulsation at the second upper interspace. The loca-

tion of murmur one inch above and to the outer side of the nipple, which was on the fourth rib.

Case II. *A very mild case, with irritable heart developed by strain.*—Wm. L., thirty years old; salesman. While playing ball, at the age of fifteen years, he was running for the "home plate," when he became suddenly weak and his heart began to palpitate and seemed to be "running away." He stopped and sat down, and in fifteen minutes the heart as suddenly stopped palpitating. The tachycardia has continued during the last fifteen years to return on the slightest provocation, such as coughing spells, active exercise, prolonged work, dyspeptic attacks, cold, etc. Smoking has a bad effect on his heart.

On November 29, 1890, he had an "influenzal cold," with sore-throat, soreness of the chest, and some fever and catarrh. He had also palpitation, rapid pulse, pallor, sweating, and frequent vomiting. His heart jumped and fluttered; he had a dull ache at left apex. He has had half a dozen spells of palpitation. Pulse was rapid and heart laboring.

There was a slight pulsation at second left interspace and a vague murmur above left nipple. Dulness on percussion at left apex anteriorly.

Case III.—S. M., fifty-two years old. Could not run with other boys, and was not strong enough to cope with his playmates. As a child, any exertion brought on shortness of breath and a "hard beating of the heart;" but he could walk all day, and would outwalk those who could run and beat him at other violent exercises. He had night-sweats twenty years ago, a cough for five years, spat blood two years ago. Pulsation at second interspace; murmur at third interspace, which was distinctly heard just above the left nipple.

Case IV.—E. G., thirty-six years old; married; mother of eight children. Her labors have been easy, without unusual symptoms. Has never had rheumatism. "She was always a 'quiet child,'" her family said; "always tired after work, and when very much exhausted her lips were blue. She was a chronic dyspeptic."

Last September she had night-sweats. She had a slight hemorrhage last week, presystolic murmur at third interspace in the nipple toward apex of left lung. The apex of the left lung was found to have the following physical signs: resonance, expansion, and vesicular murmur were diminished.

Case V. *A very slight constriction, with symptoms of irritable heart and disturbed circulation, developed by overwork and severe athletic strain.*—J. T., twenty-five years old, came to me with an irritable heart. He gave the following history:

He worked at the gas-works, and when not employed rowed on the Schuylkill River with a boat club. He began training in a crew for a boat race, but soon "trained off," and applied to me for treatment. I found him with red, turgid skin, bloodshot eyes, general trembling of head and extremities, with hæmoptysis, a rapid heart and respiration. Upon examination I found a diffused murmur in the usual place over the nipple, and an auricular impulse.

After a month's rest all the symptoms and physical signs subsided, to return in a milder form upon active exercise or long-continued labor.

This was not a very marked case, until the unusual and prolonged athletic exercise developed the symptoms which led to the examination of his chest.

Case VI.—M. E., twenty-six years old. His father had a dwarfed life, and had what was diagnosticated to be a congenital disease of the heart, he manifesting cyanosis when the weather was damp and cold. He died about middle life with exhaustion, cyanosis, and great dyspnœa.

The patient has always played with girls, making "mud-pies," and taking part in other quiet games. He never could stand the racket made by boys.

From earliest childhood exercise has been followed by a thumping of the heart; and if continued after this he would have dyspepsia, a sick headache, and then he would take a long, enforced rest from nervous prostration. He must have nine hours' sleep, and a sleep or nap during the day in order to keep from feeling tired and good for nothing.

Four years ago he broke down while preparing for college, and had to stop. I advised him then to go to the seashore and lead a quiet, restful life. He is now, after two years, quite fleshy for him, and has perfect health so long as he leads a quiet, peaceful life.

Murmur above nipple only on exertion now (1896). No auricular impulse, which was present four years ago.

Pulmonary second sound accentuated.

He has had hæmoptysis several times.

Two weeks ago this case came into my office, and I took him to see Prof. J. M. Da Costa. After a careful examination the latter failed to discover a murmur. I then made the patient go rapidly up and down the office three times. After the exercise Dr. Da Costa readily found a marked murmur in the usual position above the nipple as indicated in my paper. The murmur was a short, loud whiff with the carotid pulse, seeming to commence and stop with it. Dr. Da Costa said that the case was to him, a novel one. He also said that he would consider the murmur a systolic one as to time. There was a pronounced accentuation of the pulmonary sound. There was no pulsation at the second interspace over the auricle, as was found at a previous examination two years before, when his heart was excited.

You will observe that the foregoing cases can be easily grouped into a class, not only by their histories, but also by their symptoms and physical signs. I will call your attention to some of the important points. You will please notice the tendency in some of the cases to lung and pleural trouble of a chronic form, with hæmoptysis and night-sweats. The lesions of the lungs and pleura were generally in the left side. More than one writer has called attention to the comparative frequency of left-sided trouble of the lungs and pleura and hæmoptysis in mitral constrictive disease. In the severer cases the auricular pulsation was decidedly marked. The location of the murmur is so far from the usual point where murmurs are looked for that it might be overlooked. The murmur was almost always absent when the circulation was quiet and there was no

consolidation of the lung to transmit it. The point of greatest intensity was above or to the left of the nipple in the third interspace. The time of the murmur presystolic or early in the systole. The murmur was not transmitted, being quite localized, except when conveyed by a consolidated lung in contact with the heart-wall. The accentuation of the second sound over the pulmonary valves was present to a greater or less extent in almost all the cases, more especially when the heart was excited. The excitement of the heart was brought on by prolonged labor, strain, dyspepsia, fever, influenza, etc.

The patients were never wild, active, romping girls or boys, but quiet and inactive, being easily fatigued. Some shrewd diagnosticians have examined some of these cases and pronounced them free from murmur, even while the heart was excited and the murmur present, having overlooked the murmur on account of its position.

The marked cases have been mostly, about ten to one, boys or growing men. Perhaps this proportion is due to the fact that they are encouraged to greater activity in play or work than are females. I have picked up a number of cases by the casual remark of a mother that one of her children was so quiet, would not play as the others did, but would sit around and read, or engage in some pastime that required no exertion.

One case was that of a young woman, nineteen years old, who nearly died while being delivered of her first child. She suddenly became cyanosed and collapsed. She was only saved by rapidly delivering her with instruments, thus preventing any further bearing-down effects.

Most of the cases applied for treatment on account of symptoms of irritable heart, and the majority of the remainder were recognized by the history of the dwarfed life, and then by active movement developing the murmur. The murmur was almost always inaudible when the heart was quiet, but vigorous exercise would immediately develop it. The murmur was presystolic, or with the first part of the systole, at the top mitral area,

or immediately above, or above and to the outer side of the left nipple, and generally associated with an auricular impulse.

In all the cases where the disease was well marked hypertrophy of the left auricle was present, as shown by pulsation in the second left interspace.

The symptoms are those of a laboring heart, emaciation, a dark, muddy or blued complexion, soft muscles, relaxed skin, and a general want of enthusiasm for anything that requires activity, for activity soon begets weakness, dyspnœa, tachycardia, and exhaustion. When exhaustion occurs a long time is required to recuperate the strength.

Post-mortem. The disease being one that is not fatal, the large proportion of the cases are still living; consequently post-mortems have been few. I have had three opportunities of having examinations made after death. All were attended with negative results, so far as the size of the mitral orifice was concerned. The difficulties were that no one was able to state exactly how large the mitral orifice should be in a given-sized heart. One pathologist measured the orifice with his three fingers arranged side by side (000), another placed his three fingers closely together, one on top of the other two, $\left(\begin{smallmatrix}0\\00\end{smallmatrix}\right)$, and the third one measured it with a cone. All were said to be normal size. They all exhibited a healthy condition of the endocardium, which would assist in the supposition that they were healthy. Again, the left auricles were all hypertrophied and dilated, which gave the heart the appearance of being larger than normal, while the left ventricles were rather small.

Who can answer the question, How large should the mitral orifice be in the heart of given size or weight?

I do not think that the constriction should be great to produce the symptoms herein described; for, while the blood current is slow, it is large enough to allow the blood to pass without a murmur, but when the blood runs faster and is in larger bulk the murmur then appears, but during the interval no murmur is discoverable.

Prognosis. The mild cases are long-lived, unless some

accidental disease cuts the patient down, as pneumonia, endocarditis, chronic phthisis, œdema of the lungs from Bright's disease, or some other disease not well borne when accompanied by a crippled circulation.

Strains during the period of active growth are serious, in that the lungs become congested from the stasis produced by the interference of the blood-current. If this is frequent or long-continued, it results in chronic congestion, degeneration, or a sudden airless, œdematous condition of the lung, called by the old writers carnification.

In the young the disease sometimes seems to become milder as development and growth take place, especially about puberty.

If the affection is severe, the patients generally die before middle life; but if it is slight and they are careful, they may live to quite an advanced age with comparative comfort and usefulness.

Treatment. It is of vital importance that this condition should be recognized early, as by proper advice as to mode of life, occupation, etc., a life may be prolonged and made useful. An active business with long hours will be surely followed by serious results. The orifice being unable to transmit enough blood to supply the body without effort, this effort ultimately wearies or excites the heart.

In addition to this, the blood is backed on the lungs, producing congestion, which, when very marked or when frequent, is followed by chronic degeneration.

All active pursuits and long hours must be interdicted. Direct the business to the capacity of the patient, varying with the degree of the disease. Correct all errors of diet, as an attack of dyspepsia will often bring on an attack of heart excitement. Avoid exposure to cold and dampness. Guard against anger and mental anxiety or excitement. Stop all venereal excesses. Tell them always to live like old people. Banish anything that would be likely to bring on diseases, especially of the heart, lungs, blood, or nervous system. If the heart is excited administer belladonna, asafœtida, the bromides, camphor, valerianate of zinc, or any nervous sedative.

The congestive and chronic lung trouble should be treated according to the usual rules.

Overwork or long hours tell on the strength slowly or rapidly, and if the disease is even slight we have a loss of flesh and strength, with occasional palpitation.

If the work is very active, the irritable heart may be the first symptom. When the symptoms are noticed the patient should be *put to bed without electricity* and *massage*, and should subsequently stay in bed eight or ten hours at night, and in the middle of the day should lie down.

Conclusions as to lesions. The reasons for considering it a constriction of the mitral orifice:

1. The chronic congestive lung trouble found associated with this condition.

2. The chronic lung disease almost always found on the *left* side.

3. The venous stasis and weak arterial circulation.

4. The character of the murmur. It is presystolic, mitral, or with the early part of the first sound.

5. The location of the murmur. It is over the left border of the heart, about the location of the mitral orifice.

6. The loudness of the murmur would indicate that it required the force of the blood-current only found in the left side of the heart.

7. It is a sharp, short, whiffy murmur, which sounds quite near to the chest-wall.

8. It is never transmitted, except when the lung is consolidated.

9. The symptoms generally tally with cases having acquired mitral stenosis of a mild character.

10. The hypertrophy of the left auricle, which almost always accompanies mitral obstructive disease.

11. The accentuation of the pulmonary second sound; for, if we have constriction of the mitral orifice, the stopping of the current of the blood, when hurried, dams the blood backward, causing a sudden shutting down of the pulmonary valve and causing the pulmonary second sound to be accentuated.

Reasons for believing that it is congenital:

1. The symptoms all date back to early childhood.

2. It is unassociated with regurgitant disease, which is the most frequent form of heart disease from endocarditis, and so often associated with mitral constriction.

3. The murmur is generally inaudible when the heart is in a quiescent state.

4. Under a favoring life it does not progress as old inflammatory conditions usually do.

5. It seems to be hereditary, *e. g.*, a mother and her daughter, two children in the same family, and a father and son.

6. The deficiency of development and growth from early life in most of the extreme cases.

7. On post-mortem examination in neither case was any change, indicating either present or previous inflammation, found in the endocardium about the valve or orifice.

8. The absence of previous disease that would be likely to produce endocardial inflammation.

In conclusion, I would ask you to test your weak and quiet patients by a rapid run, followed by the application of the ear above and outside of the left nipple, and I am sure that you will sometimes be surprised.

Perhaps some of the evanescent murmurs described by various authors may be of the kind I have presented to you in this paper; for sometimes in lying down the murmur is lost, and on rising it is found.

I am satisfied that if marked cases of the affection under discussion should be called out as soldiers, requiring prolonged, exhausting marches, into any sudden activity, an irritable heart could be produced.

In reading this paper I feel that I am right in my conclusions. If I am wrong, and your interest is attracted to this class of cases and a positive solution is discovered, I will feel that my labor has not been lost. My only query would be, Why should this murmur be so much higher than in the ordinary cases of inflammatory, mitral stenosis, and why should it sometimes occur after the presystolic period ?

DISCUSSION.

Dr. Babcock: May I ask if the foramen ovale was examined in Dr. Curtin's cases which came to necropsy?

Dr. Curtin: Yes; this opening was examined and was found closed.

Dr. Babcock: I make this inquiry because I do not understand why the presystolic murmur was not conducted to the apex, as is usual in mitral stenosis, and it occurred to me that perhaps the enlargement of the left auricle might have been due to more or less patency of the foramen ovale. The past winter I stumbled upon my first and only case of pulmonary stenosis, which I diagnosed as a congenital stenosis. Upon post-mortem examination the pulmonary stenosis was found, but there was no defect in the interventricular septum or marked patency of the foramen ovale. There was a small opening in the foramen sufficient to admit a wooden match and part of a second one, but the physician who made the necropsy stated that this opening was no greater than he had observed in about 40 per cent. of the post-mortem examinations made at the Cook County Hospital, and in which the foramina were considered closed. On this ground, therefore, the pulmonary stenosis in question was decided to be acquired and not congenital.

Dr. Quimby: I have taken much interest in Dr. Curtin's paper for its full and accurate description of a class of cases to which my attention was attracted early in my professional life, through being myself the possesser of what I believed to be a slight amount of congenital mitral stenosis. From a boy I have known that there was a point in physical exercise beyond which I could not go without undue cardiac distress.

Without having suffered the more severe symptoms described in the paper, I did recognize in my own case the irritable heart and the signs of pulmonary distress under severe strain. Never having had rheumatism, scarlet fever, or specific disease, and finding that the condition grew no worse with years, I was led to the diagnosis of congenital smallness of the mitral orifices years ago.

As Dr. Curtin's paper is the first, so far as I know, to point out this as a frequent condition, I wish to express my appreciation of the value of the paper and to bear witness to its accuracy from my own experience. The subject seems to be of special importance just at this time, when we are being consulted so frequently regarding the use of the bicycle.

Dr. Curtin has clearly pointed out that when the patient is at rest

there may be no physical sign of the trouble. It was the appreciation of this fact that led me for some time past to make all examinations, to determine the safety of bicycle-riding, just after the patient has taken some pretty sharp physical exercise sufficient to develop an excited heart's action. When patients, as often happens, who have already learned to ride, come for an examination, I insist upon going to their homes and meeting them just as they come in from a long, sharp ride.

I am convinced that by following such a plan we shall save many persons from serious and permanent injury. I have now a young man under my care who is a typical representative of the class, and whose college course has been broken up, I believe, by excessive use of his wheel.

In conclusion, I would like to put in the form of a general rule what Dr. Curtin has essentially pointed out, that to estimate accurately the capacity of a heart to do work it is necessary to examine it in hyperactivity as well as under normal conditions.

Dr. A. H. Smith: The murmur which has been referred to I have occasionally met with after acute disease, situated midway between the apex and base, and disappearing as the patient recovers. It is entirely different from the hæmic murmur.

Dr. Knight: Dr. Curtin's paper has been of extreme interest to me. The high situation of the systolic murmur calls to mind that described by Balfour in temporary dilatation. The murmur was situated quite high up, more in the pulmonary area. The systolic part in Dr. Curtin's case may have been due to leakage.

It is possible that in a case of congenitally small heart there should be no signs or symptoms until an unusual strain comes. In a case which I have in mind a young woman of twenty years or over had always been disinclined to active play. I used to see her during the summer and noticed that she sat around on the walks or spent her time in sailing, but never took any part in games like tennis or ball. It is true she went into the water, but usually spent the time in floating about—she was rather fat. In the course of time she married, and ten or twelve days after confinement she was seized with severe pain in the right side; afterward on the left. She had no chill, but some elevation of temperature, and developed a consolidation of lung, first on one side and then on the other. I was asked to see her in consultation, and I said, "It is probably a case of pulmonary infarction." There was phlebitis in both thighs. The heart-sounds were weak, but there were no murmurs. After an attack of pain, about four weeks after the first, she lapsed into a septic condition, and at the end of another week died.

I was present at the post-mortem made by Dr. Councilman, who

found large plugs in both iliac veins, but no pulmonary infarction, but the smallest heart that I ever saw in an adult human being; and hypostatic pneumonia, attributed by Dr. Councilman to a congenitally weak heart; the valves were sound and competent.

Dr. Babcock: Was the aorta unusually small?

Dr. Knight: It was not described as abnormally small.

FEBRILE ENDOCARDITIS IN THE AGED.

By W. M. GIBSON, M.D.,
UTICA, N. Y.

In my consultation practice I have often been surprised at the accuracy with which practitioners who rely chiefly on their text-books for their information make the diagnoses of valvular heart-lesions and detect changes in the heart-muscle. But it has been the exception to see in consultation cases of febrile endocarditis in the aged in which the febrile condition was attributed to the endocardial inflammation. One reason for this, it seems to me, is that the average text-book on the practice of medicine, in dealing with natural lesions of the heart, does not call sufficient attention to the fact that in old people a re-inflammation of a cardiac lesion is not an uncommon thing. It must be remembered, also, that we do not look for febrile conditions in advanced life, apart from pneumonia, so much as for degenerations or disorders of nutrition, or diseases characterized by cachexias.

Febrile endocarditis in the aged is almost always ingrafted on an old valvular lesion. The disease, however, may have its origin late in life in an attack of acute articular rheumatism, or it may result from some other form of infection.

In all of the cases coming under my observation a history of a previous valvular heart affection could be obtained. In our text-books the following are mentioned as exciting causes of acute endocarditis: rheumatism and many of the other infectious diseases, especially scarlet fever, diphtheria, pneumonia, erysipelas, pyæmia, smallpox, and typhoid fever. It

is also recognized that it may occur as a complication in phthisis, Bright's disease, diabetes, cancer, and gout. It may occur also in the course of otitis media, pylephlebitis, phlegmonous inflammations, periosteal disease and necrosis of bone. I have met with it as a complication of dysentery in aged people. Recently I have found that a common cause of re-inflammation of an old cardiac lesion in an aged person is the form of influenza which has prevailed so widely during the last few years. The nervous exhaustion and the depression of general vitality resulting from an attack of influenza must impair the nutrition of the endocardium as well as that of the heart-wall.

Among old men I have found that endocarditis is not infrequently the result of infection from a purulent inflammation of some portion of the genito-urinary tract. Injuries of the prostate and deep urethra by dirty or forcibly used catheters are dangers which cannot be regarded lightly in aged subjects of valvular heart disease. Bad hygienic surroundings, long-continued exposure to cold and damp, and the excessive use of alcohol have, too, some influence in depressing heart nutrition.

Traumatic infection in the aged is always a serious matter, and doubly so if the aged person is afflicted with a heart-lesion. It must be remembered that traumatic lesions in the aged are not always accompanied by external signs of infection, and that the evidences of infection are often only to be found in parts distant from the seat of the injury.

Prolonged grief and shock seem to have some bearing as causative agents in this form of endocarditis. One case occurring in my practice, that of a man, aged sixty-three years, who succeeded in keeping up a compensation for an aortic obstruction and mitral regurgitation for nearly twenty years, developed, immediately after the sudden death of his wife, an endocarditis which wound up in a fatal uræmia. No other cause could be assigned for this endocarditis except the depression of nutrition attendant on his grief.

In another case of a similar lesion in a woman, aged seventy-five years, shock, caused by being roused up from sleep by a burglar, was followed by rapid dilatation of the heart and en-

docardial inflammation, which was accompanied by febrile movements lasting nearly two months.

A definite relationship seems to have been established between endocarditis and certain micro-organisms. Weichselbaum, in a series of twenty-nine cases, found in seven the diplococcus pneumoniæ; in six, the streptococcus pyogenes; in two, the staphylococcus pyogenes; in eight, bacteria of various natures;. and in the remaining six the culture-experiments were negative. He found also that pure cultures of streptococcus pyogenes and staphylococcus aureus, when injected into the veins, gave rise to endocarditis; but Weichselbaum calls especial attention to the fact that this endocarditis was far more malignant if the valves of the heart were not in a normal condition at the time of the experiments. Remembering the pathology of endocarditis, we can easily see that thrombotic deposits upon the altered valves, or necroses of the endocardium, may readily occur in almost any form of blood infection. We must remember, too, in studying endocarditis in the aged, that the essential change in the senile heart is a weakened heart-wall, and also that the senile heart has to deal with alterations in the structure of the arteries. Again, that the resulting venous stasis not only calls on the weakened heart for greater work, but also interferes with the nutrition of the nerve-centres which furnish the energy that governs the vascular mechanism.

With a knowledge of the condition of the senile heart, it is rather to be wondered at that endocardial inflammation is not more commonly met with in old age; but perhaps the anatomy of the organ may explain this: the fact that the heart in performing its work provides for its own nutrition first and that of the brain next.

If an attack of endocarditis in an aged person results from a rheumatic infection, the symptoms are usually pronounced enough to call attention to the heart early in the onset of the disease. Again, if it occurs as a result of serious traumatism, it can hardly be mistaken.

A few such cases have come under my observation, and

their clinical characters have stamped them as high-grade acute maladies. These cases have been speedily fatal, dying either from uræmia, embolic pneumonia, cerebral embolism, or general septicæmia, and were undoubtedly cases of acute typhoidal or malignant endocarditis, and were easily recognizable as such from the onset.

In the majority of the cases that I have seen the course of the disease was subacute or lingering. A history of gradual loss of strength, interference of digestive functions and general nutrition, without apparent cause, was obtained. The subacute form of endocarditis in the young and in adult life runs, as a rule, a protracted and irregular course, and in the aged this disease does not differ much in this respect; if anything, its course is more irregular, and it may be weeks before alarming symptoms are manifested. Rarely at the onset is there much dyspnœa or pronounced interference with cardiac functions.

The misleading features of endocarditis in advanced life are those which are common attendants on degenerations and cachexias. The progressive emaciation and disturbance of stomach and intestinal digestion are very apt to call attention to the state of the digestive organs and institute a search for a new growth or some profound disturbance of digestion. Again, the chills and sweats, with an irregular type of fever, lead one to suspect the onset of some one of the fevers. Some of my cases have passed on into a low typhoid condition, with many of the characteristics of that state, including enlargement of the liver and spleen, before marked interference with the circulation became apparent, or before an embolism of the brain, lung, or kidney occurred to demonstrate the serious nature of the endocardial inflammation.

In the early stages of the disease the temperature-curve is generally irregular; but, as a rule, as the disease advances the fever becomes continued. High temperatures are not usually recorded, except in malignant cases, or at times in the course of the disease when an embolism occurs, or when pneumonia becomes a complication.

The continued type of the fever is also broken if the case

becomes thoroughly septic; then the temperature may range from an extremely high point to subnormal. The fever of endocarditis in the aged seems to bear a certain relationship to the character of the infection producing the endocarditis. But if an infection has not been detected and the physical signs of an endocarditis have not been appreciated, although perhaps recognized, this febrile movement is a very misleading and perplexing symptom.

I have been called in consultation in a number of these cases simply because the attending physician could not make out the nature of the fever he was dealing with. Some of these cases were regarded as irregular cases of typhoid fever by the physicians in charge. In all of them there was a history of a previous valvular lesion, and there were present the physical signs of an acute endocarditis.

In drawing a line between endocarditis and typhoid fever in aged people, it seems to me that the statistics compiled by eminent clinicians should be borne in mind. For instance, Liebermeister gives the percentage of cases of typhoid fever occurring in aged people between the years of sixty-one and seventy as only 0.06 per cent. The mental hebetude characteristic of typhoid fever is seldom, if ever, present in the early stages of endocarditis in the aged. We would expect to meet with in typhoid fever in the aged very alarming cerebral symptoms if the infection was malignant enough to produce endocarditis early in the course of the disease.

In endocarditis in the aged, the mind, as a rule, is clear and the patient is often able to direct his affairs with but little fatigue. Even after a continuation of the febrile condition for several weeks it is remarkable how little disturbance of cerebral function is exhibited, unless a cerebral embolism has occurred. The nervous symptoms we do meet with are chiefly those of mild febrile and toxæmic irritation, such as slight headache, disturbed vision and hearing, restlessness and insomnia. In all of these cases it seemed to me much better to regard the febrile condition as the result of an endocarditis, rather than to look on it as the expression of a typhoid infection.

I have the records of twelve cases of subacute endocarditis in aged people which were mistaken for various types of malarial fevers. In no one of these could any of the forms of the plasmodium malariæ be detected. The chills, the fever and sweats, the enlargement of the liver and spleen, and the digestive symptoms were all pointed out as evidences of malarial infection. The heart-murmurs, the progressing changes in the heart-wall, the dyspnœa, and in some instances cerebral and renal embolism, while recognized, were considered results of malarial infection.

In one case my diagnosis of endocarditis, instead of malarial fever, was considered refuted by the occurrence of a profuse hæmaturia, although the hæmaturia was followed by a suppurative nephritis. But one case has come under my observation in which the malarial plasmodium was detected during an attack of endocarditis in an aged person, a case that occurred in the practice of Dr. Ford, of Utica, and I think he will agree with me that the malarial symptoms played a very unimportant part compared with those of endocardial inflammation.

The diagnosis between malarial fever and endocarditis in the aged, it seems to me, can readily be made, especially if the patient has not received much quinine. I have found that even ordinary doses of quinine affect the aged subject of an endocarditis unfavorably, and its administration could hardly be carried to the point of clearing the blood of the malarial parasites without producing much heart-depression. In the stage of septicæmia in endocarditis the general disturbances are so profound that were they due to a malarial infection, the plasmodium would be present in great enough numbers to admit of ready detection by a careful observer. If in one of these cases this organism cannot be detected, and all the physical signs of a progressing inflammation of the endocardium are present, this, with a history of a previous valvular heart-lesion, ought to be sufficient to indicate the true nature of the disease.

As I have remarked before, the progressive emaciation and digestive disturbances seen in the endocarditis of the aged might lead one to suspect the presence of a new growth.

Persistent vomiting, which is often present, is certainly misleading. I saw a case last winter, a man, aged sixty-seven years, who had been reduced to an extreme degree of emaciation after a siege of two months of fever attended by vomiting which could be only controlled for a day or two at a time. Just previous to my visit he was seized suddenly with a severe pain in the pit of his stomach and vomited shortly after a considerable quantity of fresh blood. At about the centre of the lesser curvature of the stomach a small circumscribed tumefaction could be detected. Physical examination of the heart revealed harsh blowing murmurs at the aortic and mitral orifices, and also extreme dilatation. This man gave a history of having irregular chills, fever, and profuse sweats for several weeks prior to the fever becoming continued. The urine was highly albuminous and contained numbers of granular casts. The physician in charge of the case had been very much puzzled to account for the febrile symptoms; but, while recognizing the heart-lesion, had suspected the presence of cancer of the stomach. The occurrence of the hemorrhage and the detection of the tumor seemed to him a confirmation of his suspicions. I ventured to make the diagnosis of endocarditis with embolism of a branch of the gastric artery. I saw this case recently when all the febrile symptoms had subsided, the tumefaction in the wall of the stomach had disappeared, the vomiting had ceased, and the cardiac lesions were again being compensated for.

Another case coming under my observation, that of a man, aged sixty years, gave a history of several attacks preceded by periods of irregular chills and fever, sweats and persistent vomiting. From the last attack he passed into a low septic condition. He had become greatly weakened and much emaciated. The diagnosis of cancer of the stomach had been made by several physicians. I found at my visit all the evidences of endocarditis with dilatation of the heart-walls. The urine was loaded with albumin, granular casts, pus-casts and Ultzman's pus-plugs. In view of the man's septic condition and the physical signs of an endocarditis, the diagnosis of cancer did not seem to me warranted, especially as no tumor could be

made out. He passed into a low typhoid state, and died from exhaustion. At the autopsy no trace of a new growth could be detected. In the mucous membrane at the cardiac portion of the stomach several small, light-yellow patches were found, from which radiated distended veins, evidently the results of minute embolisms. The liver and spleen were much enlarged and showed evidences of parenchymatous degeneration. The right kidney presented the condition of complete fatty involution, and in the left kidney numerous pyæmic abscesses were found. The heart was extremely dilated, the walls thin and softened, and the valves were ulcerated and covered with thrombi of recent formation. The history of this case extended with some intermissions something over two years; during the greater part of this time a continued temperature-curve was noted by the thermometer.

In following up, then, our cases of valvular heart-lesions in aged people, it may be well to bear in mind that an inflammation of old lesions can easily be provoked, and that while we seek to keep up compensation for the obstructing lesion or the insufficient valves we must be on the watch for something more than the signs of failing heart-muscle. Pyrexias, even of short duration, should be regarded with suspicion. Recurrent attacks, especially if accompanied by chills, digestive disturbances, or any septic symptoms, warrant the assumption that the old lesion is the seat of a new endocardial inflammation, even though pronounced cardiac symptoms are absent.

DISCUSSION.

Dr. Knight: Dr. Gibson has given us an excellent picture of malignant endocarditis. These cases present peculiarities in diagnosis. I have seen a number of them in consultation, and the usual account given is this: "Doctor, I thought this was a case of typhoid fever when it began, but it has been running on so long it must be something else. Do you think it can be a case of tuberculosis?" If he has read about ulcerative endocarditis he might be led to suspect

it; but very often the condition is overlooked, especially if there are no cardiac symptoms. In many cases we may be able only to infer the condition. In a case of this kind the attending physician said, "Why, I don't see any signs of endocarditis?" but the autopsy proved that my inference was correct. Not long after that this same physician called me to a case in which he was sure we had to deal with a similar condition. The symptoms, however, were not so clear to my mind. This patient died, and the autopsy proved that he, too, had ulcerative endocarditis.

I should like to ask Dr. Gibson if he has found it more common in the aged?

Dr. Elsner said that he frequently met with endocarditis in aged people as an unrecognized disease; that he saw many cases in consultation in which the cardiac lesions have not been connected by the physician in charge with the febrile state.

Dr. Gibson said in reply to Dr. Knight: I wish to state that I did not intend to impress anyone with the idea that the disease is more commonly met with in advanced life, but that very frequently the endocardial inflammation, as a cause of the febrile conditions observed, is lost sight of.

Dr. Bergey: A point that has been applied, only incidentally, and yet is of great importance, is the fact that the cardiac lesions which Dr. Gibson has outlined in his cases are secondary in character. It is only in cases of old valvular disease that such conditions are liable to result through secondary infection.

Dr. Curtin: I have given a good deal of thought as to the manner in which influenza acts in producing endocarditis. In the great majority of cases there has been a catarrhal nephritis followed by the endocardial trouble, probably caused by the poisoned condition of the blood resulting from the kidney affection. These cases are generally associated with or follow catarrhal fever, which follows the initial attack of influenza. Endocarditis very rarely occurs in the early inflammatory stage of the influenza.

PNEUMONIA IN FLORIDA.

By FRANK FREMONT-SMITH, M.D.,
ST. AUGUSTINE.

The distribution of pneumonia in the States of America or Europe depends little upon latitude or the effects of cold. The Southern States of America suffer equally with the Northern; the islands of the West Indies are frequently stricken; Cuba, St. Thomas and St. Domingo, Brazil, Peru, Chili, and Paraguay in their native population have a high death-rate. Pneumonia in the northern sections of Europe is not more severe than in Greece, Turkey, and Italy. Venice has a fatal form. Pneumonia of the Desert, in the Soudan, Zanzibar, and in Africa destroys nearly all those attacked. Winter visitors to southern latitudes are less subject to disease than natives.

Thirteen years of practice among the native and non-resident inhabitants of Florida furnish an experience which has suggested this contribution. For confirmation I have called upon various active members of the profession for their experience, and have also received the valuable assistance of Florida's State Health Officer, Dr. J. Y. Porter, who has kept an accurate record of deaths for the State Board of Health during the past five years.

The conviction that pneumonia is a very rare disease, even among the susceptible colored population, is fortified by St. Augustine's physicians, whom I have consulted.

Dr. A. Anderson reports that he has seen not more than six cases of croupous non-intercurrent pneumonia in twenty-five years of practice.

Dr. J. K. Rainey has seen two cases in colored and none in whites in fifteen years of practice.

Dr. A. S. Dunham in ten years has attended six cases among whites, five in colored patients.

Dr. De Witt Webb reports two in colored and none in whites in fifteen years of practice.

Dr. L. Alexander, County Health Officer, has seen eighty cases in sixteen years of practice.

Dr. William F. Shine reports ten cases in colored and white in thirty years of service.

My own records show seven cases of non-intercurrent croupous pneumonia, two intercurrent, and two broncho-pneumonia in thirteen years. Three of these were importations—one a colored porter, taken from his train to the Alicia Hospital, dying with double pneumonia, and two white waiter visitors, both having had the initiatory chill on the steamer sailing to Jacksonville. These both recovered at the hospital.

Dr. Frank H. Caldwell, Sanford, Fla., chief surgeon of the Plant System of Railways, writes: "In fifteen years of practice I have only had six cases of pneumonia; no deaths. Two of the six cases were colored. This includes not only my private practice, but the Railroad Hospital, in which 4000 to 5000 cases have been entered—nearly all colored.

Dr. Lewis W. Pendleton, of Portland, Maine, physician to the hotels at Palm Beach, reports no cases of pneumonia in those hotels during the winter of 1895–6.

Such concurrence of testimony furnishes valuable knowledge. Two cities in Florida suffer out of proportion to the remainder of the State—Jacksonville and Pensacola. In the former Dr. Sollace Mitchell informs me that the disease among colored is quite frequent, and that physicians who especially attend colored state that few of these recover. Among these, in larger cities, poor sanitation, dissipation, specific infection, and mixed blood, all have preparatory influence.

At Alicia Hospital, St. Augustine, where the entire number of cases treated in six years preceding May 1, 1896, was 720, the whole number of cases of pneumonia is five, three of which have already been mentioned as importations.

The official death-record of St. Augustine from May 1,

1878, until February 1, 1892 (fourteen years), indicates 1435 deaths from all causes; among these, forty deaths were from pneumonia, or 2.8 deaths yearly in a population of 7000, including winter non-residents. Thus the death-rate of St. Augustine becomes 0.4 of one per thousand population. The rate for Northern cities is from 1.5 to 3.5 and greater per thousand.

The Florida State Board of Health has furnished me with official returns for the whole State for five years, ending December 31, 1895. The population of Florida is 391,422. The total number of deaths from pneumonia for five years 827, or an annual average of 165.4, one death to each 2372.5, or 42 per 1000.

For the Atlantic coast counties southward from St. John's county, St. Augustine, parallel 30°, to Dade county, parallel 26°, the population is 39,334, with an average yearly mortality per pneumonia of eleven; one death to each 3576 inhabitants, or 27 per 1000 population. Thus the mean annual mortality for Florida is 0.42 per 1000, and for the Atlantic coast counties from St. Augustine southward is 0.27.

These statistics include white and colored. It has not as yet been possible to secure complete reports on the rate for each race. The colored population is peculiarly susceptible, and few cases recover.

A complete analysis of this branch of the subject will another year supplement the present report.

FIBRINOUS BRONCHITIS, WITH REPORT OF AN ACUTE CASE.

By JOHN WINTERS BRANNAN, M.D.,
NEW YORK.

The subject of fibrinous bronchitis has never been discussed by this Association, though one of our members, Dr. W. C. Glasgow,[1] published an exhaustive study of the affection some fifteen years ago. The disease is extremely rare, particularly in the acute form.

The following case came under my observation in July, 1895. Mrs. G., a woman about forty-five years of age, and in excellent physical condition, had been under my care for some ten days for a Colles's fracture of the right arm. Her family record was negative, with the exception of a history of gout or rheumatism on the maternal side. She herself was of an excitable, nervous temperament, and had had symptoms suggesting gouty tendencies. On the 29th of June I changed and reapplied the splints to her arm, and left her in apparently perfect health. Two days later, on the morning of July 1st, I was sent for in haste, and found her in considerable distress. She stated that she had gone to bed the night before as usual, feeling perfectly well. During the night she was awakened by a sense of oppression in the chest and great difficulty of breathing. Toward morning she was taken with paroxysms of coughing which finally resulted in the expectoration of clumps of a grayish-white substance, which were floating in a glass of water on my arrival. The expectorated masses, when

[1] St. Louis Courier of Medicine, 1880, vol. iii., page 109.

shaken up a little in the water, proved to be a rather firm, tough membrane, resembling that found in diphtheria, but branching and twig-like in form. It had evidently come from the medium-sized bronchi of the lungs. There was no involvement of the upper respiratory passages. The dyspnœa had been greatly relieved by the expulsion of the bronchial casts. There was but little fever, the temperature being about 100°; the pulse was 96; the respiration somewhat quickened by the nervous apprehension of the patient.

Physical examination was almost wholly negative in its results. The percussion-note was resonant throughout the chest, the breath-sounds were somewhat diminished, but there were no râles or other evidences of an inflammatory process in the lungs. I prescribed a simple expectorant mixture of iodide of potassium and muriate of ammonia, with codeine to quiet the mental agitation of the patient. On the next day a few scattered moist râles were heard in the lungs. Casts were expectorated at intervals for two or three days, but otherwise the case pursued the course of a mild catarrhal bronchitis, and the patient was well in a week.

On questioning the patient as to her past history, I learned that she had had one similar attack, but much more severe, some ten years before, which had lasted two weeks. At that time,[1] as on this occasion, no exciting cause for the onset of the disease could be determined. There was one other fact of interest in the history of this patient, which may perhaps throw some light upon the etiology of fibrinous bronchitis. She said that several times in her life she had had circumscribed swellings upon different parts of the body, but especially upon the arms and hands. The swellings came on suddenly, sometimes after she had by chance plunged her hands into very cold water, but at other times without evident cause, unless perhaps indigestion or some mental disturbance. The description of the affection corresponded with that of angio-neurotic œdema. According to Dana,[2] there is reason

[1] The patient was then under the care of the late Dr. A. L. Loomis.

[2] Text-book of Nervous Diseases, page 488.

to believe that neurotic œdema may sometimes attack the stomach, or even the lungs, though he considers the latter unlikely, as the vasomotor innervation of the pulmonary bloodvessels is very stable. It is known, however, to attack the larynx and throat, and it is within the range of possibility that fibrinous bronchitis is an angio-neurosis of the bronchi, resulting in a fibrinous exudate instead of the serous transudation of neurotic œdema.

Fibrinous bronchitis has been the subject of several elaborate reviews during the past thirty years, notably those by Lebert,[1] Riegel,[2] Glasgow,[3] West,[4] and more recently Beschorner.[5] I shall not, therefore, deal with the disease at length, but shall simply touch briefly upon some of the most striking features.

Ætiology. The etiology and pathology of fibrinous bronchitis are most obscure. Modern investigations have added little to our knowledge of the affection, beyond establishing the nature of the exudate in the bronchi. Until the middle of the present century the expectorated masses were variously described as pulmonary bloodvessels, fleshy polypi, coagulated blood, inspissated mucus, lymphatic concretions, or cast-off bronchial mucous membrane. Remak,[6] in 1845, was the first to insist upon the fibrinous character of the membrane, and he gave to the disease the name of "fibrinous bronchitis." Beschorner, in his recent article, states that in two cases observed by him the bronchial casts were composed of mucus. All other modern writers agree that the exudate is made up mainly of fibrin, containing in varying proportions epithelial cells, leucocytes, fatty matter, air-bubbles, and granular detritus.

Some acute cases whose clinical course resembled that of an acute infection were thought to be diphtheria with unusual localization of the exudate. The membrane in these cases, however, failed to show the Loeffler bacillus in any instance, and

1 Deutsch. Arch. f. Klin. Med., vol. vi., page 74.
2 Ziemssen's Cyclop. of Practice of Medicine, vol. iv., page 438.
3 Op. cit
4 The Practitioner, 1889, vol. xliii., page 83.
5 Sammlung: Klin. Vortr. n. F., Leipzig, 1893, No. 73 (Int. Med., No. 25, p. 617).
6 Cited by Beschorner, loc. cit., page 625.

inoculation of animals also gave negative results. Other micro-organisms have been reported by two observers. Picchini[1] found three varieties of cocci in the expectoration of three laborers who were affected simultaneously with the disease. He apparently made no cultivation of the micro-organisms, but inoculation of the trachea of animals produced an affection resembling fibrinous bronchitis in the human subject. Sokolowski,[2] in a recent paper, describes an acute case, characterized by high fever of two weeks' duration, in which the staphylococcus aureus and the staphylococcus albus were found in the expectoration. He succeeded also in reproducing these micro-organisms in various culture media. Sokolowski is, therefore, of the opinion that acute fibrinous bronchitis conforms to the type of an infectious disease, and is possibly caused by the staphylococcus aureus and albus. He also believes that chronic fibrinous bronchitis is etiologically quite distinct from the acute form of the disease.

Fibrinous bronchitis is observed more frequently in males than in females. It occurs at all ages, but most often between twenty and fifty years of age. A few cases have been reported in early childhood, and one case at the age of seventy-two years. Hayn,[3] in 1842, described the post-mortem findings in the case of a newborn infant that seemed perfectly well at birth, but died one-half hour later. On autopsy the bronchi and bronchioles were found filled with a fibrinous exudate.

Among predisposing causes tuberculosis has been assigned great weight by some authors. Syphilis also has been noted in a few cases. On the other hand, many of the persons attacked had been in previous good health. It is probable that neither tuberculosis nor syphilis has any direct etiological connection with the disease. A family predisposition is occasionally seen, cases having been reported in which several members of the same family have been affected by it. In many instances fibrinous bronchitis has apparently taken its

[1] Cited by Beschorner, loc. cit., page 635.
[2] Deutsch. Archiv f. Klin. Med., 1896, Bd. 56, Heft 5 and 6, page 476.
[3] Cited by Beschorner, loc. cit., page 624.

origin from a catarrh of the bronchi of greater or less duration. Sometimes it has followed exposure to atmospheric changes, as in ordinary bronchitis. In other cases no such exciting influence could be ascertained. It would seem that some especial individual predisposition must exist in the person attacked, but the nature of this predisposition is as yet unknown to us.

Symptoms and course. Fibrinous bronchitis occurs in both acute and chronic forms. The acute form may begin like a simple bronchitis, or the onset may be marked at once by urgent symptoms, such as chill, high fever, paroxysms of cough, and intense dyspnœa. These symptoms may continue for several days, and are not relieved until the fibrinous casts are expelled. In the case of my patient, the expectoration of the casts began within twenty-four hours of the beginning of the attacks. The expulsion of the casts is sometimes attended with hæmoptysis, which may be profuse. There is usually a decided fall of the temperature, which rises again if the casts reform. Immediate relief follows upon the ejection of the membrane, and in mild cases the patient convalesces rapidly. In severe cases in which the casts are not expelled cyanosis supervenes, and the patient dies of asphyxia or exhaustion. In one fatal case a tracheal cast lodged in the glottis and caused death by suffocation. The duration of the acute cases varies from a few days to two weeks. About one-half of the acute cases terminate fatally, sometimes as early as the third day.

The symptoms in the chronic form of the disease resemble those just described, but are, as a rule, less urgent. The attacks usually follow upon long-continued bronchial catarrh. The disease may last for years, the paroxysms recurring at regular or irregular intervals. The interval may be as long as sixteen years. In one case attacks occurred daily for seven years, then ceased entirely. Physical exploration of the chest during the attack often reveals little that is distinctive. Resonance on percussion is normal. The respiratory murmur is usually more or less suppressed over the region of the occluded bronchi. If one lung only is affected, inspection may show

less movement of that side of the chest. Râles may be heard if there be accompanying bronchial catarrh. A flapping or fluttering sound has been described in some cases when the casts have become loosened in the bronchi. After expulsion of the casts respiration may be heard in the parts of the lung before impervious to air.

Pathology. But little remains to be said of the pathology of fibrinous bronchitis in addition to what has been stated above. On post-mortem examination the bronchi usually present the appearances of ordinary catarrhal bronchitis, and, in addition, contain membrane more or less widely distributed. In acute cases both lungs are involved, as a rule. In chronic cases the process is generally more circumscribed. The membrane is moulded to the shape of the bronchi and is somewhat firmly attached. The casts are insoluble in water, but are soluble in alkalies, especially in lime-water, a fact of therapeutic importance. As already described, they consist of coagulated fibrin intermingled with cells of various kinds. Two explanations are offered of the mode of origin of the coagula in the bronchi. According to Klebs,[1] the casts are formed from transuded plasma of the blood combined with an exudate of white blood-cells which have escaped from the vessels. E. Wagner,[2] on the other hand, believes that the casts owe their origin to a peculiar metamorphosis of the epithelium of the bronchial mucous membrane, by which the epithelium forms the cellular elements by endogenous cell-production and the fibrinous framework out of the remaining cellular substance. The view of Klebs has, at least, the merit of greater simplicity. He, however, in common with all other writers, fails to explain why the exudative process should be limited strictly to the bronchi, and should recur in certain individuals for years at periodic or irregular intervals.

Diagnosis. Fibrinous bronchitis can only be diagnosticated with certainty where the characteristic arborescent casts are expectorated. A probable diagnosis may often be made if there be a history of previous expectoration of membrane, and

[1] Cited by Beschorner, loc. cit., page 635. [2] Ibid.

the patient exhibits the symptoms and physical signs already described. The diagnosis is often difficult with young children who swallow their expectoration. Beschorner suggests that probably some cases of acute, suffocative bronchitis are really fibrinous bronchitis. Six such cases are reported by Legendre[1] and Fauvel,[2] which ran the ordinary course of an acute, intense bronchitis, ending fatally. On autopsy pseudo-membrane was found in the finer bronchi and bronchioles of both lungs. Even in adults the real condition may not be appreciated if the case terminates without dislodgement of the casts. Cutler's[3] case is instructive in this respect. He saw his patient for the first time some three hours before her death. She was a woman sixty-five years of age, and gave the history of a slight bronchitis of a few days' duration. Cutler found her sitting up in bed, deeply cyanosed and in a profuse perspiration. The percussion-tone was normal. Fine dry râles were heard over the whole chest, and also coarse tracheal râles. Cutler made a diagnosis of diffuse capillary bronchitis. The result of the autopsy was as follows: "Pharynx and larynx healthy. Tracheal mucous membrane injected in lower half and slightly thickened. A croupous membrane lay reflected on itself over the entrance of the two primary bronchi. When laid in place this membrane reached less than half-way up the trachea. Downward it extended into the minutest divisions of the bronchi, in many of them forming an almost solid plug. The alveoli contained no solid matter, and, except in a few places where there was œdema or collapse, they contained air."

Prognosis. The prognosis of fibrinous bronchitis is always doubtful. It should be especially guarded in the acute form, as the disease results fatally in one-half of the cases in adult life and three-quarters of those in childhood. The prognosis of the chronic form is more favorable as regards life, but very doubtful as to complete restoration of health or freedom from future attacks.

[1] Cited by Beschorner, loc. cit., page 630. [2] Ibid.

[3] Boston Med. and Surg. Journal, 1881, vol. civ., page 443.

Treatment. The indications for treatment are fourfold: 1. To favor the loosening and expulsion of the casts from the bronchi. 2. To prevent or diminish their formation. 3. To cure or relieve the bronchial or other complications. 4. To improve the general condition of the patient.

The croupous exudate is soluble in lime-water and other alkalies, and many observers have seen apparent benefit from the use of lime-water in the form of inhalations and sprays, with the addition of caustic soda. Inhalations of steam are also advised. Breathing into rarefied air and compression of the thorax during expiration may aid the expulsive effort of the bronchi. Emetics are most valuable, especially apomorphia in hypodermic injection. In one severe case the application of mustard to the entire chest resulted in prompt relief. The iodide of potassium is probably the most useful remedy in all forms of the disease. It increases the bronchial secretion when given during the acute paroxysm, and thus aids in expelling the casts. It also seems to lessen the tendency to a recurrence of the attacks if it is given in full doses and for a long period of time.

The catarrhal bronchitis which so often accompanies the chronic form of the disease will require appropriate treatment, as will also other complications or sequelæ, such as tuberculosis, emphysema, or asthma. Stimulants may be needed during the acute attacks, and general tonics may be of service in the intervals to improve the nutrition of the patient. A change of climate is sometimes necessary in this as in other forms of pulmonary disease.

DISCUSSION.

Dr. Schauffler: The term *chronic* fibrinous bronchitis is a mistake, in my opinion. The recurrence of fibrinous bronchitis in any individual is usually at long intervals—of years, for instance—and each time it is an acute bronchitis.

Some years ago I had the opportunity of seeing two groups of

fibrinous bronchitis in a farming region in western Missouri. The first group consisted of three persons in the same house, two adults and a boy twelve years old, all of whom recovered. None of them showed any exudation in the fauces. Two of them expelled fibrinous casts of the medium-sized bronchi. Three years later three other cases occurred on two farms adjoining the first. Two of these were in children, aged about eight and ten years, and one in an adult. One of the children died. This was before the day of making the diagnosis of diphtheria by cultures and the microscope. But there was nothing in the history of these cases to justify the supposition that they were diphtheria.

MECHANICAL WATER-FILTERS.

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I have written on this subject because of its hygienic importance, and because it is evident that but little correct knowledge concerning it exists among the masses of the medical profession.

While the general subject of water-filtration has been much agitated in the lay press, but little has been said to give a clear understanding of mechanical water-filters themselves.

The construction which is preferable from a mechanical consideration, and the relative advantages and defects of the different filtering media, have scarcely been discussed. It would seem that what knowledge is possessed by those who have given some thought to the subject, or who have purchased filters for their homes, has been merely derived from the very questionable statements made by agents advertising some special device. Seriously objectionable and weak points are well covered. A part of the whole truth is thus often very deceptive. The requirements requisite in a satisfactory water-filter, as enumerated by competent authorities, are:

1. That it should yield a sufficient supply of water free from color, of crystal-like transparency, and thoroughly free from all visible matter, as well as all micro-organisms and organic matter in solution.

2. The filtrate should be free from all taste acquired during filtration.

3. The filtered water should not be rendered insipid.

4. The filter should be so constructed as to assure the filtering media being readily and automatically cleaned at very frequent intervals. After such cleansing it should at once yield a perfectly filtered water, so that the house pipes may at no time have flow into them water that is only imperfectly filtered.

5. It should be readily taken apart.

6. It should have present, in sufficient quantity, a filtering medium having the power to destroy all organic matter in solution. This should be of a character capable of retaining its power for a long period of time.

7. It should also have a medium which would arrest all organisms and their spores, and all other matter in suspension invisible.

8. The filtering medium should yield nothing to water that would favor the growth of low forms of life, should it be contaminated by spores or organisms after filtration.

9. There should be nothing in the construction of any part of the filter that could undergo putrefaction or could yield metallic or other impurity to the filtrate.

10. The addition of chemicals or coagulants to prepare the water should not be permitted.

11. It should be simple in construction and manipulation, and the cost should be sufficiently low in price to render it procurable by all classes of people. In pipe connections, contaminations by sewer gas should be rendered impossible.

When strong light is made to pass through unfiltered water the suspended matter, which may be seen in the water by the unaided eye, is not its most objectionable constituent. The real disease-producing elements are pathogenic bacteria, their excretions, and the dissolved products of their decay after death.

Bacteria possess the same functions as higher organized life; they breathe, eat, excrete, and multiply, and many have the power of moving about in the water. They differ somewhat in size, but as an average, it is necessary for over a hundred to be agglutinated, as in a culture-growth, before a speck large enough to be seen by the human eye without a magnifying lens is formed.

The natural life of bacteria is usually only a question of hours, if its food-supply is cut off. The spores or eggs of bacteria have a very tenacious covering, and are more difficult to destroy than any other form of organic life. A dry heat of from 329° to 340° F. applied for several hours or a steam heat at 212° F. applied for over four hours is required to kill them. These facts are the most important to be kept in mind in considering water-filtration. The impurities in unfiltered water visible to the unaided eye and all stain and color may be removed by imperfect filtration, and a filtrate of crystal-like clearness and very pleasing appearance may be yielded, which still may be laden with the invisible disease-producing bacteria and organic products in solution. Such water with its hidden poison is like a wolf in lamb's clothing. If all bacteria and their spores could be removed from water so protected that none could be afterward introduced, the visible impurities of the kinds usually found could be permitted to remain without danger of producing disease in those who drink it. The greatest ill derived from visible impurities lies in the fact that they supply the food necessary to the lives of the bacteria. If water be made free from impurities and from the products already in solution, bacteria cannot live in it, but will soon die by starvation. Bacteria never develop spontaneously. When they are found present in water or anywhere else they or their spores of necessity must first have been introduced there from some infecting source.

As a slightly analytical illustration of what is usually contained in river water supplied to cities, and because the matter which has been suspended in the water is the real medium used for filtration in many popular filters, a partial list is given below of what was found by microscopic study of matter removed from a city water-supply by a filter. This study is the work of J. D. MacDonald, M.D., R.M., F.R.S.

Of mineral substance the matter removed contained fine grains of carbonate of calcium, sand, flint, iron-rust, earth, etc.; of vegetable products, pollen of many grasses and weeds, fine bits of partially decayed straw, grass, weeds, leaves, wood, etc.,

probably derived from manure which had been scattered abroad and washed or blown by the wind into the river; there were found of house refuse matter, bits of linen, vegetable products, hemp-fibre, cotton, etc.; of animal products, the ova of many varieties of minute animals of earth, air, and water environment, minute parts of disintegrated and decaying bodies of animals of all sizes, such as part of a leg of cockroach, of house fly, and of spider; many bits of indistinguishable wings, hooklets, eyes, abdominal organs, eggs, skins, etc. It contained bits of mosquitoes, silk, wool, hair of animals in large variety, epithelium scales in variety, bits of decaying flesh of striped character foreign to fresh water, scales of insects, and minute parts of moths, caterpillars, butterflies, and many insects. There were present bacteria in over one hundred varieties, gelatinous fronds with imbedded bacteria growing in them, over thirty types of diatomes, an endless number of types of low forms of organisms higher in order than bacteria, and many specimens of parts of low forms of animals in order of development up to and including insects. Innumerable other things not enumerated were found. The use of such material for making the bed to be used as the filtering medium suggests *similia similibus curantur*, or a dainty dish to set before a bacterium. The objections to a mass of such deposit, supported on a framework of coarse, granular material, as a filtering medium are so evident that it will not need further mention. When a filter with such a bed becomes clogged and has to be opened to clean it, it is common to find a revolting mass of putrid decay teeming with worm-life.

Filters on the market may be divided into four classes:

There are, first, those using as the filtering medium tubes made of various powders, such as clay, diatomaceous earth, tripoli, etc., made into masses with flour, sugar, fine wood-dust, bread, etc., and formed and baked in kilns, in the manner used in producing pottery-ware, or of tubes made from porous silicious rocks, which are very soft—little harder than chalk. Tubes from this material are formed by the use of the turning lathe.

The second class includes filters known as packed filters, which use no coagulant to prepare the water for filtration, and which consist of one or more beds of granular material, such as animal and vegetable charcoal, magnetic carbide of iron, magnetic oxide of iron, coke, oxide of manganese, and polarite.

The third class embraces packed filters using preparatory chemical coagulants. These are usually packed with gravel, sand, ground-flint, pumice-stone, ground-glass, etc., all in grains too coarse to be effective without the preparatory coagulant.

Of the baked or natural stone-tube variety, that known as the Berkfeld, using as the base of its composition a special deposit of earth, found only in Germany, especially rich in diatomes, has proved by scientific tests the most efficacious in removing micro-organisms, and on this account was given a medal by the Franklin Institute of Philadelphia.

It is claimed that the bacteria contained in the water are caught in the microscopic furrows and rugæ which are characteristic of these shells.

The tubes are very soft and friable, and are difficult to scrub clean, and in a few days' time the bacteria grow through the pores to the outside of the tubes, and so contaminate the water, and also gradually so occlude the tubes as to render them useless until cleaned. These tubes are made in Germany, and are too expensive for general use.

The Chamberland tubes of the Pasteur filter comprise the fourth class.

The most prominent and competent, experienced, and unbiased bacteriologists in their works and lectures all teach that the Chamberland tubes of the Pasteur filter, even when without defects in the making or in their attachments in the filter case, are only effective in removing all micro-organisms from water for from three to four days, by which time the bacteria appear on the inside of the tubes.

All tube-filters, every third day, should have the tubes scrubbed and boiled or heated to about 360° F., or should

have filtered through them, after scrubbing, some form of solution containing chlorine, or one of permanganate of potassium, followed by a solution of oxalic acid, and, of course, afterward washed by having a quantity of filtered water made to filter through.

The friction of water going through these pores enlarges them after a few years' continuous use, so as to permit bacteria to pass. This fact and the effect on the size of the pores of a multiple of chemical cleansings by permanganate of potassium and oxalic acid or chlorine solutions are points worthy of notice.

In times of bad water these tubes, if used to any great extent, become so clogged and sealed over by deposit that they will yield water only in slow drops, or often none at all, and consequently have to be scrubbed repeatedly during a single day. These tubes are very delicate, brittle, and friable, so that breakage is an element of material expense to consider.

These tubes are only made in one size, about eight inches long by one inch in diameter, and one-sixteenth of an inch in thickness, and cost probably not more than two to five cents to make, but cost the purchaser one dollar each.

If every tube is not accurately in its place after the cleaning, or if a tube has received a little crack in any manner, bacteria-laden water is sure to leak in and to contaminate the filtrate.

It is true that this filter is an excellent one if it receives all the attention it requires and the small yield is sufficient. I have enumerated these facts, however, because both physicians and the laity are apparently educated to the full conviction that if they have water which has been filtered through a Pasteur filter it is therefore necessarily sterile of all micro-organisms.

No automatic device has been or can be constructed for successfully cleaning these tubes, for simple outside cleansing of them does not suffice, as each individual pore has to be cleansed and sterilized. This can only be done by heat or chemicals. As the care of the filter is almost invariably left to servants,

who do not understand its requirements and do not fulfil them, it becomes in general use a misplaced trust. It depends exclusively on its minute pores to remove foreign matter, and has no oxidizing or other chemical action on organic matter in solution. All solutions pass through these tubes, and, as the accumulations of micro-organisms on their outer side are deposited in an excellent culture-media, the colonies grow there rapidly. The chemical products eliminated from the live bacteria ptomaïnes from the decay of the dead bacteria all pass through these tubes into the filtered product. Absorbed into animal bodies the pathogenic ptomaïnes give rise to that form of infection known as putrid intoxication.

Should a filter with much accumulation on the tubes be left for a few days the first water afterward passing through would almost assuredly contain an appreciable quantity of ptomaïnes in solution. The rapidity of the multiplication of bacteria seems to be rarely appreciated. Cohn states that under favorable conditions a bacterium becomes two bacteria at the end of an hour. At the same rate of increase, at the end of forty-eight hours they would number 280,000,000,000. This, however, never occurs to such an extent, as it is modified by their own produced ptomaïnes, but it indicates the absolute necessity of frequent and thorough cleansing of all mechanical water-filters. Unfiltered water contains about a hundred varieties of bacteria, of which but a few are pathogenic. The pathogenic are those producing typhoid fever, cholera, tuberculosis, malaria, special types of diarrhœa, and a few other less important diseases.

Filters using tubes made from tripoli or silica stone have more porosity than the two kinds described; therefore they yield a greater supply of water.

Their relative merits in preventing the passage of bacteria do not seem to have been very positively determined. In an advertising sheet issued by the vendors of the Pasteur filter a report is made by Hartly, sanitary chemist of Indiana, in which he states that the product of the Pasteur contained no bacteria, while samples from two filters using tripoli stone

tubes yielded growths from cultures after twenty-four hours. This report smacks of having been written for the purpose for which it used, as he does not state whether the tripoli stones were free from defects (a common fault) or whether the stones and all receptacles, etc., of the filtered water had been fully sterilized just before the test. Four days' use of his Pasteur tube would have caused cultures to produce growths.

Before considering the mechanism of the filters using granular filtering media, the media will be tersely studied.

These media may be classified into porous grains possessing the power of destroying by oxidation organic substances in solution, and porous grains which do not possess such power. Ground pumice-stone is the principal granular substance of the latter class.

Next, we have non-porous grains acting purely mechanically by making small interspaces when packed together. The oxidizing powders are animal and wood charcoal, spongy iron, magnetic carbide of iron, polarite, and coke.

The non-oxidizing porous powders used are gravel, sand, flint, hard blue marble, garnet stone, glass, etc. No filter could be found which used these non-oxidizing, non-porous powders in grains sufficiently fine to be effective media in themselves. They all depended on accumulations in the interspaces and on top of the bed of such matter as had been removed from the unfiltered water. For the reasons (numbered 2, 3, 6, 7, 8, 9, and 10) enumerated in the requirements of a satisfactory filter, all filters of this class should be discarded. The non-oxidizing, non-porous powders, such as gravel and cracked or ground-flint, marble, glass, and garnet stone, are the granular substances used in most filters of large capacity. Gravel is of little use, being too coarse. Sand, by reason of the endless attrition to which it has been subjected, has been so rounded in individual grains as to make the interspaces, when it is packed together, too nearly square or round openings. Openings of the same area if oblong are much more obstructive to suspended matter in water. The fracture of garnet stone is too ragged and irregular to produce the most

effective interspaces. In fine ground-glass excellent interspaces are secured, but the possible danger from any minute particles of glass in any way getting into the filtered water renders its use objectionable.

Hard marble is excellent, and it neutralizes any acids in the water, but if it is present in too large proportion it may harden the water perceptibly. A very hard fine cracked flint is the best of all these substances, and it makes an interspace very narrow and obstructive. The porosity of such a bed is very great, so that its water-yield is large.

Then again we have granular powders which produce a chemical oxidizing action on dissolved organic matter, and so destroy the food of the disease-producing contaminations of the water and such dissolved organic matter as is pathogenic. These powders are wood charcoal, animal or bone charcoal, spongy iron, magnetic carbide of iron, polarite, coke, etc.

For a long time the greatest faith was placed in charcoal, especially animal charcoal, as a purifier and sterilizer of water when used as a filter medium; and many people unfamiliar with the facts proved by investigations of competent scientists by modern methods of research still retain this confidence. The following are the facts about animal charcoal to which all authorities who have investigated agree. If packed closely, in form of fine grains, in liberal quantity, it will keep back micro-organisms and oxidize organic matter in solution for twelve days. After thirty to forty days the bacteria passing through are fully five times as plentiful as in the water before filtering, they having multiplied in the grains of boneblack and been given back to the filtered water. After this time the power of oxidizing the dissolved organic matter has become extinct, and can only be regained by reburning the charcoal. Its power to oxidize organic substances is limited to dead or putrefying matter, for the gases from which it has a special affinity. Live matter, such as egg albumin, passes through unchanged. It contains phosphate of lime from the bones from which it is made. This is gradually given up by solution to the filtered water, rendering it a rich field for the development of micro-

organisms. Filtered water from animal charcoal will not bear storing; but, as it affords the conditions and rich food for bacterial development, it soon becomes foul and filled with visible growths. It cannot be depended on to remove from water disease poisons. It very soon becomes an infector instead of a purifier of water, only removing the color and visible suspended matter which are least prejudicial to health. If used at all in times of bad water, the filter should be repacked with fresh material every week, and under no conditions should the packing remain longer than a month. It cannot be cleansed by washing and passing solutions through the filter. For general household use it is a deception and an abomination, and should be discarded. This is the report of Chaumont and Natter, two of the greatest authorities known on hygiene and sanitary science. As regards animal charcoal for filtration their position is fully concurred in by all competent bacteriologists and hygienists. Coke is sometimes used. It does not affect organic constituents in solution and gives off sulphur compounds and other impurities of metallic or earthy character retained from the coal from which it has been made. Of the iron compounds used for filter media the magnetic carbide—very porous and containing about 12 per cent. of carbon, in combination—is not only the best of the iron compounds, but the best of all the oxidizers thus far discovered. It gives off nothing objectionable to the filtered water. If kept clean by means of previous grosser filtration of the water and by the frequent breaking up of the bed and attrition of each individual grain against its fellows or against intermixed fine ground-flint, by reversed currents of water being driven through it, it retains its oxidizing power almost indefinitely and is not itself destroyed. It is so finely porous that the area of its surfaces, with which water may come in contact, is very great. In its action of oxidizing organic matter it acts by its great magnetic carbonized metallic surface causing the decomposition of water, liberating hydrogen and oxygen. The oxygen as oxygen and as ozone—the oxide of oxygen—oxidizes and destroys dissolved organic matter, thus removing all food for

bacteria and so quickly causing their extinction. Its action can be compared to a multitude of tiny stores in which the organic matter occurs.

Polarite is an oxide of iron, both mixed and combined with silica and aluminum. It is very much slower in action than the magnetic carbide, and in fact it is too slow to be an efficient oxidizing media for use in a filter.

Such filtering media as asbestos-fibre, wood-pulp or paper, cotton or linen in any form, felt, etc., do not at all comply with the requirements enumerated as requisite for a satisfactory filter, and they should never be used.

The preparation of the water for filtration should in order be next studied. This is accomplished by the addition of chemicals to change the chemical and physical properties of impurities, to be removed by filtration, so that they may be separated more easily. The chemicals used are styled coagulants, and are alum, sulphate of aluminum, permanganate of potassium, sulphate of iron, sulphate of copper, fluorine salts, etc. Of late nearly all have been abandoned but alum.

The dealers in filters using coagulants assure the public that the quantity of alum used is small, and that it is so entirely decomposed that none passes through the filter, and, therefore, that its use is entirely free from deleterious effect. This, unfortunately, is only part of the truth, and, therefore, is deceptive. The vendors claim that but from one-fourth to one grain of alum is used to each gallon of water. The most reliable authors of books on hygiene say two to six grains of alum to the gallon are used. I have been unable to find any of the filters using alum which had an automatic alum cup, that is, one which could only supply alum to the water when water is passing through the filter. In nearly all alum-using filters these cups are attached to the upper side of the pipe supplying unfiltered water to the filter, and they have a small opening into the pipe, the size of which opening is controlled by a handle attached without. It is claimed that as the water flows through the pipe, when the filter is acting, the water which has entered through this small opening to the lumps of alum in the

cup has made a heavy concentrated solution, which naturally sinks through the small opening into the water flowing past. Were the filter constantly in operation this would probably be correct; but when not in operation, as is usual during the night and at other times for a few hours, there is nothing to prevent the concentrated alum solution flowing constantly into the water in the supply pipe. After such rest it is certain quite an increased quantity of alum will be contained in the water first flowing into the filter. Alum is very soluble—one part in nine of water. An experimental test was made by placing an alum cup in a vessel containing one gallon of water so that the top of the cup was just submerged. The alum cup was charged with one pound of alum broken in large pieces, and the opening in the cup was made just the area of a hole made by a common domestic pin. It was allowed to stand without the least agitation for twenty-four hours. A quantitative analysis of the gallon of water was then made, to learn how much alum had passed into the water through the minute hole, by the force of the diffusion of liquids of different specific gravity. It was found to be eighty-two and one-half grains.

The chemical action of alum in water is as follows:

Alum is a sulphate of aluminum and potassium or ammonium, containing an excess of sulphuric acid. Unfiltered water contains carbonate of calcium or lime in solution. In the chemical reaction the aluminum and potassium are replaced by the lime, by which hydrate of aluminum and potassium is formed and sulphate of calcium and some free sulphuric acid is formed. The sulphate of lime and sulphuric acid remain in solution and the hydrate of alumina is precipitated. The action of alum on the organic matter is chemical, and is the same as the reaction with the lime, except that the organized substances such as albumin take the place of potassium in the reaction and is precipitated with the hydrate of alumina. In these reactions the sulphates of lime, potassium, and free sulphuric acid pass through into the filtrate. One hundred and seventy grains of sulphate of lime are soluble in one gallon of water. The hy-

drate of alumina is extremely insoluble, and is precipitated in minute particles which quickly come together, forming little tufts and shreds, which aggregate and sink. By this mechanical process of the hydrate of aluminum, the suspended matter is caught as if by a finely meshed net and carried down.

The action of the sulphate of calcium and free sulphuric acid can be very well demonstrated by its chemical action on metals with which it comes in contact, for which the sulphuric acid has a stronger affinity than for the calcium base. It is not unusual for the thin fine brass gauze or perforated brass metal which is at the bottom of the filter-bed, to support it, to be gradually corroded and destroyed by this acid and salt.

The hinge-joints in the devices for automatically closing the valves in the flush tanks of water-closets have been so corroded as to stop their action. A cessation of the trouble was secured when the use of the alum in the filter was discontinued.

The physiological action of the long-continued ingestion of this acid and filtered water is, namely: 1st. When water has not been drawn for some hours an excessive quantity of alum passes through and may be reclaimed. 2d. When by careless adjustment of supply-valve too great a quantity of alum is permitted to pass in. 3d. When there is insufficient lime or organic matter to decompose all the alum, which occurs in soft water.

Many filters have been invented intended to be adapted to the use of granular beds. Many cannot be properly cleaned in any easy way, and are abominations. Others are constructed on incorrect theories, and are inefficient. Others are mechanical monstrosities.

The main point sought for is to devise a successful automatic arrangement by which to clean the beds. No filter should use alum, especially if it has no automatic device by which the alum is cut off when the filter is not in use. Adapting all up-to-date and authoritatively proven facts and knowledge from experience, to the construction of a mechanical water-filter, it should be as follows: It should be composed of at least three distinct and separate compartments, the unfiltered water should

enter the first of these, in which should be removed practically all suspended matter, and in the first compartment it should filter through a bed of fine cracked flint and hardest blue marble. In this bed the water is mechanically prepared for finer filtration and chemical purification from dissolved organic matter in the next. The second bed should consist of a liberal quantity of fine-grain, hardest variety of magnetic carbide of iron intermixed with a small quantity of very fine cracked flint. The final bed should be composed of flint in grains very much finer than any that has ever heretofore been the custom to use in a filter. This can be made to pack together very closely, so that the interspaces will be mostly of the character of an enormous number of minute slots by reason of the smooth flat surfaces lying in close apposition.

Such a fine bed as should be used would probably be very quickly cut off by the sealing effect of the gelatinous deposit formed on it, were the water not first filtered free from all visible suspended matter and thinned by destructive oxidation of all dissolved organic matter.

It should be possible to clean each bed separately, and at different times, without in the least disturbing either other bed. The last bed should be cleansed only with water which has filtered through the two preceding beds after they have been closely settled and packed together and are performing their parts of the work effectually.

The best method of cleaning should probably be by a device which would reverse the flow of water so that it should enter at the bottom of the bed. The device should form the water in columns such as is sent from a restricted elongated nozzle. The columns of water should be directed in spiral and other directions so that every particle of the bed may be broken up and violently churned and agitated.

By some device all confusing multiplicity of valves should be done away with, and, if possible, all actions be controlled by one compound valve, with the action at each position of each movement so plainly worded on the valve that no mistake could be made in its operation by anyone who could read.

No alum or chemical coagulant should be used. There seems no good reason why the breadth of the interspaces in the last bed should not be as small as the diameter of the pores in a Chamberland tube. As necessity is the mother of invention—a mother who is ever fructifying—it is entirely possible that some such filter as described will be devised and perfected by someone possessing inventive skill.

THE INFLUENCE OF CLIMATE ON GENITO-URINARY TUBERCULOSIS.

By JOHN C. MUNRO, M.D.,
BOSTON.

In the cities and large towns along the Atlantic seaboard tuberculosis of the kidneys, bladder, prostate, vesiculæ, epididymes, or tubes is far from rare; it is frequently overlooked, especially in the earlier stages, and often, when recognized, the disease has created so much havoc that nothing can be done beyond making the victim comfortable. The pathetic, relentless suffering in the later stages in such cases warrants the plea that physicians should endeavor to detect the invasion as early as possible, and that no rational treatment promising relief should be neglected.

For a long time it has been recognized that the class of patients under consideration is best treated by a careful outdoor country life in conjunction with surgical interference when necessary or possible. If this be true, and there can be no doubt of the fact, cannot more be gained by sending such cases, at least in the incipient stages, to a climate where other forms of tuberculosis are benefited or cured?

In order to answer this question, a circular was sent to the members of this Association requesting their views and experiences, and the writer takes this opportunity to express his gratitude for the many replies sent him, so full of kindly interest.

Of seventy-five responses, about fifty are more or less replete with valuable data, but, as it is impossible to give credit to each shade of difference and interpretation, it has seemed best

to condense the data, and treat them as if they were the result of a single physician's large and varied experience. Reports of a number of interesting cases in support of one view or another have been sent, but it is not practicable to incorporate them in a brief summary.

The views of the majority on any one question are, perhaps, given undue prominence; the attempt, however, is made to give equal consideration to the opinions of the minority, no matter how small it may be.

Of the reply to the first question—"Are patients with tuberculosis of the kidney, bladder, epididymis, prostate, or vesiculæ benefited or injured by climatic treatment?"—there is scarcely any doubt. There is no reason why the situation of the disease should form an exception to the rule, especially if the general resistance and the nutrition are improved. The benefit is, of course, indirect for the most part, but it can be materially aided by proper local treatment, not necessarily operative in the majority of cases.

The rate of improvement is not so rapid as it is in pulmonary phthisis, and it may be that, for reasons unjustly ascribed to the climate, cases occur in which harm follows this method of treatment. But in the East, patients are much improved if not often cured by an outdoor life, and it is not difficult to understand that the benefit might be increased by emigrating to that part of the country where the opportunities for and the benefit from an outdoor life are naturally greater.

One or two correspondents write that they have never seen any good follow climatic treatment in the class of cases under consideration, but their experience differs so much from that of the other members that one is constrained to believe that they have, unfortunately, seen only the late forms of the disease, where any treatment is hardly more than palliative. It is to avoid sending this very class of cases that the good results from a healthy climate in the incipient stages should be emphasized. A few writers contend that joint tuberculoses do well without regard to climatic influences; but it must be borne in mind that the genito-urinary form is less localized, more easily dis-

seminated, and cannot be placed in the same category as the former. Furthermore, there is good reason to believe that joint cases are better treated in a high dry climate.

"Do patients undergoing climatic treatment for pulmonary tuberculosis develop, commonly, a genito-urinary tuberculosis when the pulmonary lesions are disappearing?"—that is, do physicians in healthy climates see genito-urinary tuberculosis as frequently as we do in unhealthy (tuberculous) climates when patients exhibit practically no other manifestations of an active invasion of the tubercle bacilli? Apparently such a development is very rare. Four correspondents report having seen single cases only during many years of practice, while primary genito-urinary tuberculosis is comparatively unknown, a condition far different from that which obtains in tuberculous regions.

"Does pulmonary tuberculosis tend to develop in patients undergoing climatic treatment for genito-urinary tuberculosis?" So few patients, proportionately, are sent for treatment of genito-urinary tuberculosis alone that a definite answer cannot be given, but there seems to be no noticeable tendency to invasion of the lungs in the early stages, and in all probability, if such a tendency did exist, it would be retarded or prevented in a suitable climate.

In advanced cases, on the other hand, pulmonary invasion is as common in one climate as another, but how far such a complication may be retarded cannot be answered without further investigations. In general, most observers agree that there is very little inter-relation between the disease in the lungs and in the uro-genital tract.

"After apparent cure from genito-urinary tuberculosis can patients ever return to their homes?" Probably to a small extent in selected cases, when the cure has lasted for many months, where the home surroundings will be of the best, and provided the patient is persistently and carefully watched. The permanency of the cure, though less frequent, is apparently as well established as in pulmonary phthisis; it is not uncommon, however, to see instances of permanent arrest without permanent cure.

The return home should be regarded in the light of a dangerous experiment, and the change should invariably be advised by the physician in immediate charge.

Where the arrested lesions can be entirely removed by surgical interference, the chances of a safe return to the former home are much increased.

"Do patients with advanced genito-urinary tuberculosis—*e. g.*, abscess of the kidney, testes, vesiculæ, etc.—ever recover their general health?" Occasionally with the aid of surgery, advanced (abscess) cases do recover, but it is doubtful if the proportion is much greater in the healthy than in the unhealthy climate. After surgical interference in an unhealthy climate, the chances of a return or of an invasion elsewhere would be lessened by emigration to an antituberculous part of the country.

"Must the same precautions, as regards exercise, diet, rest, etc., that are given to phthisical patients, be given to patients with genito-urinary tuberculosis when emigrating to high altitudes?" Practically the same precautions should be exercised in directing the daily life of such a patient as in the case of pulmonary tuberculosis, especial attention being given to the diet where there are renal or vesical lesions, and to proper exercise where the prostate or vesiculæ are involved.

Over-exercise will produce general systemic or cardiac disturbance in the same way that it does in phthisical patients, and the risk of general infection cannot be disregarded in the one form more than in the other.

These patients are less amenable to treatment than are those with pulmonary trouble, and this fact must be considered when directing their habits of life.

"Is there any one type of climate especially adapted to the treatment of genito-urinary tuberculosis?" There is no one climate or locality suitable for all cases, the general rule being that, where pulmonary cases do well, it is safe to send genito-urinary cases.

When, however, the disease is limited to the kidneys or bladder, a climate equable, warm, and not too dry should be

selected, where outdoor life is most possible, and where the drinking water is of the best. Such conditions do not exclude seashore resorts, like Atlantic City, Nassau, the Bermudas, Jacksonville, etc. In case the immediate coast is not desirable, proper conditions can be found in regions like San Antonio, Augusta, Thomasville, Aiken, Southern California, etc.

A high, cold, dry climate is unsuitable, particularly in renal cases, if a concomitant pulmonary lesion is the point of therapeutic attack, because the vigorous outdoor treatment in zero weather puts too much strain on the kidneys, and the latter organs are in a state of constant irritation, even though there is steady improvement in the chest. Even without an attendant focus in the lungs such a climate should be chosen with great caution, and with a full realization of the risk of overworking the kidneys during the colder months of the year.

Patients with the lesion limited to the epididymis or to the vesiculæ can generally be treated best in a high, dry climate like Colorado, provided, of course, there is no cardiac contraindication.

Prostatic and bladder types do well in either a low or a high altitude, care again being taken against exposure in the cold months. These cases are also benefited by treatment at the various baths, like the Hot Springs of Virginia or Arkansas, or the Hudson Hot Springs. A hot, dry, desiccating climate that naturally induces the various hepatic and pelvic congestions is unsuitable; there the acute venereal diseases are stubborn to treatment, and for the same reason tuberculous lesions would do badly.

In conclusion, we may say that genito-urinary tuberculosis is benefited by climatic treatment.

That patients should be sent to healthy climates in the incipient stages more frequently than has been the custom heretofore.

That this form is less amenable to treatment than pulmonary phthisis in the later stages, but that the results of surgical interference can be improved by climate.

That moderately dry, equable, mild climates are suitable to

the majority of patients, the high, colder climates being reserved for selected cases.

That whatever climate is chosen, the benefits depend upon proper food, hygiene, exercise, and fresh air, as in pulmonary phthisis.

DISCUSSION.

Dr. Newton: While in the United States Army I served eight years in New Mexico, the Indian Territory, and Northern Texas, and while in that region I was impressed with the scarcity of Bright's disease. No doubt this diminished liability to renal disease is because the increased activity of the skin and the lungs in the exceedingly dry atmosphere takes some of the work off the kidneys. At least such an explanation was offered once by Dr. H. C. Wood, who thought it might be advantageous to send patients with nephritis into the dry atmosphere of the Rocky Mountains or their foothills. Of course it is highly important while resident of the arid regions that the drinking-water should be as pure as possible. It should not contain gypsum (a very common ingredient) nor other mineral or earthy substances which may irritate the kidneys or bladder. I do not believe that people travelling for their health are careful enough about their drinking-water. If all the water which the new-comers use should be boiled and filtered there would be probably little or no so-called mountain fever which so commonly attacks the unacclimated.

One case that came under my observation had a tubercular consolidation of one apex and had been sent away from home; while travelling he developed an appendicitis, for which an operation was done, and he recovered not only from the operation, but his lungs were found to have healed up. It was not long, however, before tuberculosis of the genito-urinary tract set in, and his health is now in a precarious condition. I am sorry to hear that Dr. Munro considers the prognosis in genito-urinary tuberculosis so unfavorable. From my reading, especially from several papers that I have recently seen, I had been led to think that a number of these cases at least would recover.

Dr. James B. Walker: While having no personal experience with the climatic treatment of cases of genito-urinary tuberculosis, I may say that the general tenor of Charles Theodore Williams's investigations is that the presence of albuminuria or of disease of either the liver or kidneys is a contraindication to the high-altitude treatment of pulmonary phthisis, for the reason that before acclimatization there is a decided reduction in the amount of urine excreted from the

kidneys. There is no doubt much to be gained in treating these diseases by the proper use of mineral waters, and we may make almost any climate acceptable in their treatment with the use of these adjuncts, so that although high altitude climate may have their objections *per se*, their great value as antagonistic to tubercular vulnerability may be utilized in this as well as in other forms of tuberculosis by the proper administration of water and other correctives.

Dr. Schauffler: In the few cases which I have met with of this nature there was one which had a tubercular epididymis along with tuberculosis of the lung. This man was sent to El Paso, Texas, and he apparently recovered from his tubercular condition. It was one of those cases of remarkable recovery of general health and disappearance of local signs of disease apparently directly and solely due to change of climate without medication. Heard from this patient at the end of three years.

I also know of a man who had tolerably advanced pulmonary tuberculosis, with kidney trouble, pus in the urine, and tube-casts, who went to Glenwood Springs, Colorado, and is doing well at the end of five years. His renal trouble seems to be at a standstill; he probably has one sound kidney, and he is engaged in business in Colorado.

It was a revelation to me that climatic influence should be so efficacious in a case like that. As to the lungs, of course, there is no trouble in explaining the *modus operandi* of climate, but when we come to genito-urinary tuberculosis the explanation is not such an easy matter. I must say that I am decidedly in favor of climatic treatment in genito-urinary tuberculosis.

Dr. Ingals: I have been under the impression that it is in hot dry climates where most benefit is derived in cases of this kind. The late Dr. H. A. Johnson once said that "tubercular patients did well where weeds do not grow," as, for example, in Arizona.

Dr. Curtin: I should like to ask Dr. Munro if he has made any inquiry as to what extent drinking-water influences these cases?

THE URIC-ACID DIATHESIS AND ITS EFFECT UPON THE UPPER RESPIRATORY TRACT.

By WILLIAM F. DUDLEY, M.D.,
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It is proposed to briefly consider the factors productive of an excess of the uric-acid group in the blood, and to state the effects of this dyscrasia upon the nose and throat I venture to broach so vast a subject as the uric-acid diathesis, because without an appreciation of its etiology it would be impossible to understand and relieve those of its symptoms which are evidenced in the upper respiratory tract.

That uric acid exists in the blood in certain diseases is generally conceded. Garrod[1] proved this in 1848 by his thread experiment. He suspended a thread in fresh serum obtained from the blood of a gouty subject, acidulated it with acetic acid, and after forty-eight hours' immersion the thread was discovered to be coated with crystals of uric acid. Levison[2] enhanced the value of this demonstration by suspending threads in ascitic fluid, and gradually adding uric acid. He found that a 1 : 4000 solution deposited no crystals on the thread, a 1 : 2000 solution gave up a few crystals, and a 1 : 1000 solution covered the thread with a large number of crystals.

Von Jaksch[3] examined the blood of a number of diseased persons with varying results. Twenty-one cases of diseases of the nervous system showed no uric acid in the blood. In ten

[1] Garrod : "Natur und Behandlung der Gicht." Deutsch on Eisenmann, 1861.
[2] F. Levison : The Uric-acid Diathesis, p. 40.
[3] Von Jaksch : Uben die Klein Bedentung "Von Harnsaüre" im Blut. 1890.

typhoids none was found. In seven cases of anæmia with increase of the number of leucocytes, uric acid was found. Nine cases of Bright's disease out of eleven examined yielded a considerable quantity of uric acid. That uric acid cannot be estimated in healthy blood is due to the difficulty of obtaining the large quantity required for the analysis and to the rapid chemical combinations that take place. But it has been proved conclusively by Horbaczewski[1] that uric acid can be derived from the tissues of nearly all the organs in man and in lower animals. The lungs, liver, mucous membrane of the intestines, and the spleen all yielded this substance; in the latter organ 2.5 milligrams of uric acid were produced from 1 gram of spleen pulp. He extracted the nuclein from each tissue to be examined by artificial digestion, and from the nuclein obtained he derived xanthin, hypoxanthin, and uric acid.

Horbaczewski has shown by his accurate experiments that body tissues that contained no free uric acid nevertheless possess a nitrogenous substance from which it can be artificially extracted, and from which it is fair to presume uric acid is evolved during life. This substance is the nuclein of cells, and this he regards as the generator of uric acid. He found further that nuclein introduced into the body, either in the food or in a weak alkaline solution hypodermically, increased the amount of uric acid eliminated. 0.75 gram of nuclein was injected into a rabbit normally excreting 7 milligrams of uric acid daily, and in the following twenty-four hours 25.8 milligrams of uric acid were found in the urine.

Maress[2] administered 5.5 grams of nuclein to a man deprived of food for the previous eighteen hours; nuclein being more effective while fasting. During the two hours before taking the nuclein, 81 cubic centimetres of urine contained 46 milligrams of uric acid, and during the fourth and fifth hour after taking the nuclein 148 cubic centimetres of urine yielded 93 milligrams of uric acid.

[1] Horbaczewski: Reported by Levison, loc. cit., p. 201.
[2] Maress: Levinson, loc. cit., pp. 9–24.

Levison in his book on *The Uric-acid Diathesis*, from which the data given have been taken, states that it is impossible that the characteristic cells of the tissues can be so rapidly disintegrated as to produce such marked variations of uric acid as occur during life, and believes that *leucocytes*, which are omnipresent in the body, are the cells which undergo metamorphosis, and that they furnish the uric acid, and are, therefore, the key to the solution of the problem. Thus he explains the increase of uric acid found after eating as due to a temporary leucocytosis from digestive activity occurring before it is possible for the increase to be derived from the ingested food, that not having been assimilated.

In young children's blood leucocytes are much more numerous normally than in later life; and in infant's urine the relation of uric acid to urea is 1 to 9, whereas in adults it is 1 to 30 or 35.

Tyson[1] says the most frequent sediment in the newborn is uric acid, and red, sand-like crystals are at times found in the first urine discharged.

In adults the administration of pilocarpine and the continued use of alcohol[2] increase the number of leucocytes in the blood, and a corresponding increase of the amount of uric acid excreted is found. Excessive physical and mental exertion will produce the same results. Conversely, quinine and atropine diminish the number of leucocytes in the blood, and less than the usual quantity of uric acid is passed in the urine. In healthy urine the ratio of uric acid to urea is about 1 to 30 in the adult; but this proportion is subject to frequent and marked variations, which may be temporary or permanent. Internal nutrition is a process of oxidation ; the exact chemical changes which are effected are not clearly understood. Bence Jones[3] positively advanced the theory that all albuminoids in the blood are converted into uric acid, and when oxidation is complete are finally eliminated as urea, carbonic-acid gas, and

[1] Tyson: American Text-book of Diseases of Children, p. 978.
[2] Levison : Loc. cit., p. 36.
[3] Bence Jones: Journal of the Chemical Society. 1862, p. 212.

water; and that when an excess of uric acid appeared in the urine it was due to suboxidation, and that it indicated an incomplete chemical change of uric acid into neutral urea. It is now claimed,[1] as the result of the investigations previously cited, that the relations of uric acid to urea are less close and less simple. Uric acid is regarded as the resultant of tissue metamorphosis. Urea is derived from the ingested food, and the quantity of urea in the urine is influenced by the nature of the nourishment taken. The temporary increase of uric acid following eating is therefore due to a digestive leucocytosis. The use of either carbohydrates or nitrogenous food causes scarcely any fluctuation in the amount of uric acid excreted, while the urea can be doubled by a meal of albuminoids.

While there exists much variance regarding the chemical origin and relationship of uric acid and urea, there is but little lack of harmony concerning the evil results of their excess in the blood, whether that excess be due to an over-production or a faulty elimination.

It has been claimed by Fetz and Ritter[2] that urea is not the fatal poison in uræmia. They injected urea into the vessels of animals without producing fatal toxæmia, but Grehant and Quinquad[3] later caused uræmic convulsions and death in rabbits and dogs by injecting, subcutaneously, urea in an amount equal to $\frac{1}{200}$ of the body-weight. That other poisonous waste products are excreted is proved by the fact that more acute and fatal results can be obtained by injecting into the blood uræmic urine than by using an equivalent of pure urea. Ptomaïnes have also been credited with the causation of the toxic symptoms. They exist in healthy blood and are decidedly multiplied in numbers during disease. That ptomaïnes and other toxins of unknown composition are augmented in disease is undeniable. That they play no slight or harmless part in the economy, when retained, is very probable. But it would seem wisest, in the absence of definite information

[1] Levison: Loc. cit., p. 24.
[2] Fetz and Ritter: Reported by B. J. Hamilton, Text-book of Pathology, p. 548.
[3] Grehant and Quinquad: Reported by Hamilton, loc. cit.

concerning their history, to consider most carefully as etiological factors, urea and the uric-acid groups, for about them we have some definite knowledge, and they, therefore, offer the best opportunities for logical clinical explanations and successful treatment.

That production of uric acid and urea in excess of normal occurs is most evident. Unless the excess be long continued or too great for excretion, it results in no harm. It is also true that normal production associated with imperfect elimination will effect injury. Any insufficient removal of these excrementitious products by the natural channel, the kidneys, is therefore the condition indicative of danger.

The general consideration of this diathesis is passed with a full appreciation of the inadequacy of my effort to offer for your discussion those theories of the source of the uric-acid group and the causes of its presence in the system in excess of normal.

That impairment of the function of every vital tissue may result from this excess is obvious, yet like other dyscrasiæ it has localized areas of special selection for its clinical manifestations. The upper respiratory tract is chosen for closer investigation, not because the most serious effects are found there, but from the fact that this sensitive and susceptible tract gives early and persistent symptoms of the existence of the constitutional defect, and also because the dependence of these symptoms upon the general health is not sufficiently emphasized.

In its function as an organ of excretion the kidneys are supplemented by the skin and mucous membrane. Assuming the normal specific gravity of the urine to be 1020, Tweedy[1] asserts that in health, during free action of the skin, the specific gravity of the urine may ascend to 1030. Normally urea is found among the products eliminated by the skin, and when the skin and mucous membrane are acting vicariously, we find excreted uric acid and its urates, the proteids, dextrose, cystine, and other solids. Their activity may be said, therefore, to alternate with the working of the kidneys.

[1] Tweedy: Medical News, vol. lxviii. No. 7, p. 178.

In this regard the mucous membrane may be fairly considered as the internal skin, possessing as it does the functions of both secretion and excretion; maintaining also, so far as possible, its share of the balance of elimination as a relief to defective kidneys.

Undoubtedly the entire mucous lining of the alimentary canal and respiratory tract assumes the rôle of adjuvant to nephritic activity. Of this whole mucous surface the "locus minoris resistentiæ" may most frequently be found in the nose. I venture to say that no part of the human anatomy is so often the site of minor acute inflammatory affections as is the upper respiratory tract. When of its lining is required the burden of continuous excretion of toxic substances for long periods, the sequelæ are, in order: dilatation of the arterial capillaries, followed by a similar enlargement of the veins; congestion; transudation, an inflammation tending to chronicity and abnormal glandular activity.

The histology of the nose favors such a result. The most important and active physiological structures there in relation to respiration are the turbinated bodies. These occupy much of the space of the nasal chambers. In the classical work of Zuckerkandl,[1] the mucous membrane covering the turbinated bones is described as consisting of an outer layer of connective tissue coated with flat epithelium and a deep periosteal layer; between them lymph structures containing abundant venous plexuses. Penetrating these are lymph and tubular mucous glands, the latter of great length and number, extending from the free to the periosteal surface. McCoy[2] says these "plexuses of bloodvessels are out of all proportion in number and size to those ordinarily found in mucous membrane." The blood contained is venous blood, the mucous glands are surrounded and bathed by it. When, in addition, that venous blood is charged with toxic material, must it not of a certainty affect the secreting glands, causing first an increased flow of mucus and then an abnormal discharge, laden with inflammatory

[1] Zuckerkandl: Wiener med. Wochenschrift, 1884, vol. xxxiv. No. 38.
[2] McCoy: System of Diseases of Ear, Nose, and Throat, vol. i. p. 566.

products and excrementitious matter, and thus eventuate in a chronic nasal catarrh?

Mulford[1] has recently stated, rather boldly, I think: "I believe that chronic nasal catarrh has its origin because of a diathesis; that the catarrh is an expression of such a diathesis, and would not assume a chronic course if the diathesis were not present." I am not prepared to indorse so sweeping a claim. I know that chronic nasal catarrh is at times due to a purely local irritation, but I also believe that the irritant is more often not a defective septum, but a defective blood-supply, and that the obstinacy of many cases of catarrh of the upper respiratory tract can be explained by the fact that they are simply the local expression of a constitutional ailment. Imperfect cell-nutrition resulting in perversion of function is a factor in the etiology of chronic catarrh which I believe warrants careful study.

With less baneful effects the mucous membrane of the pharynx responds to the diathesis; less baneful, probably because of the difference of the blood-supply. Its appearance is well pictured by Harrison Allen:[2] "The mucous membrane is of uniform red color, the secretions are abundant, and the tonsils are tumid. Pain is not usually severe, and is referred to the pharynx and not to the muscles at the side. In true lithæmia gouty history is absent." Symptoms in other parts of the body, occasionally associated, are headache, lassitude, flatulence, loss of appetite, malnutrition of the skin, causing dryness, roughness, and itching, irritability of temper or hebetude. These conditions are generally most pronounced in the morning. This is explained by Bishop,[3] as due to the blood being most alkaline during the early hours, consequently it then holds in solution a large quantity of uric acid. The alkalinity grows less during the active portion of the day and reaches its minimum at midnight.

These conditions may prevail during any period of adult life;

[1] Mulford: American Medical and Surgical Bulletin, March 7, 1896, p. 313.
[2] Harrison Allen: Medical News, June 16, 1888.
[3] S. S. Bishop: Manual of the United States Hay-fever Association, 1893, p. 25.

those cases which most impressed me were found in young adults. These subjects may, in latter years, become victims of gout or rheumatic gout. In these latter diseases the local evidences are much exaggerated and are well recognized. They have been ably discussed by Harrison Allen, F. Whitehall, Hinkel,[1] and Duckworth. Many cases, however, do not advance beyond the lithæmic stage and give no subsequent history of gout or rheumatism. In any event it is absolutely necessary to make a thorough, general examination, for as Beverley Robinson[2] states: "It is extremely difficult to recognize in the appearance of the pharyngeal or laryngeal inflammation the nature of the diathesis which occasioned them." Much confusion exists in the literature on these subjects, from the careless interchanging of the terms gouty, rheumatic, and lithæmic in referring to diatheses. They are separate constitutional conditions, but the error is probably due to the important part taken by the uric-acid group in all their history.

I request that this paper be received, not as a complete consideration of the subject, but as a preliminary study. I have purposely omitted, therefore, the questions of prognosis and treatment, and limited myself to the endeavor to show the possible relationship of the uric-acid diathesis to that ailment so trying to patient and physician, catarrh of the upper respiratory tract.

[1] F. W. Hinkel: Transactions American Lar. Society, 1889, p. 124.
[2] Beverley Robinson: N. Y. Medical Record, December 6, 1890.

A STUDY OF HIGHLY MINERALIZED THERMAL WATERS IN THE TREATMENT OF DISEASE, BASED ON EXPERIENCE AT THE GLENWOOD HOT SPRINGS, COLORADO.

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GLENWOOD is situated at an altitude of fifty-six hundred feet, in a valley in the midst of the foothills of the western slope of the Rockies. The dryness of the atmosphere in that region is well known, the annual rainfall, including snow, being only fifteen inches. (In the Alps there is a yearly precipitation of thirty-one inches at the Engadine and thirty-nine inches at Davos-Platz.) The surrounding mountains give protection from high winds and the consequent dust which are so irritating to invalids sojourning on the eastern slope in close proximity to the great plains. Its sheltered position also makes of Glenwood an admirable winter resort. The valley widens at this point so that the precipitous hills do not deprive it of an abundance of sunshine, and the patients find it quite comfortable to exercise out of doors, and even to swim in the great salt-water pool throughout the entire year. At the altitude of fifty-six hundred feet the air is not so rarefied as to cause discomfort or any symptoms of distress. On the contrary, though there is at first a slight increase in the pulse-rate and the respirations, the sojourner presently experiences a sense of comfort and ease in his movements. Invalids suffering from non-complicated diseases of the heart and lungs bear the change of elevation as well as do those in normal health,

and are able to take physical exercise with increased elasticity and force.

Weber sums up the physiological effects of mountain climates on invalids as follows:

1. Increased action and better tone of the skin; improved nutrition.

2. Increased tone of the heart and of the contractile fibres of the vascular system.

3. Deeper respirations, strengthening of respiratory muscles, increased determination of blood to the lungs.

4. Increase of the quantity of watery vapor and carbonic acid emitted from the lungs.

5. Increase of appetite and improved assimilation of food.

6. The formation of more blood and better nourishment of the different organs.

7. Stimulation of the nervous and muscular systems to greater activity.

8. Improved sleep.

9. Increased tissue change.

The climate then, although only an adjunct to the other therapeutic agents, is a most desirable one in the treatment of those disorders which it is claimed are relieved at Glenwood, because the qualities of the atmosphere which might be disadvantageous are almost entirely absent during the whole year, while those other qualities, the proper use of which raises the bodily strength and facilitates the restoration of the affected organs and functions, are present.

The mineral springs are about fifty in number, but only a few of these are utilized. These few, however, yield about two thousand gallons of water a minute, a supply seen to be most generous, when we consider that all the numerous establishments at the Hot Springs of Arkansas have to depend on a flow of three hundred and sixty gallons a minute (Walton.) The natural temperature of the water is 127° F. Great quantities of H_2CO_3 and H_2S are evolved. NaCl constitutes a large proportion of the salts in the water, but the degree of mineralization is so high that were all the NaCl eliminated

there would still remain a sufficiently large percentage of saline ingredients to make it rank with the strongest of mineral waters.

The following is the analysis of the water of the Yampah Spring at Glenwood, made by Charles F. Chandler, Ph.D., New York, June 12, 1888.

In one U. S. gallon of two hundred and thirty-one inches of water:

Chloride of sodium	1089.8307 grains.
Chloride of magnesium	13.0994 "
Bromide of sodium	0.5635 grain.
Iodide of sodium	trace.
Fluoride of calcium	"
Sulphate of potassium	24.0434 grains.
Sulphate of calcium	82.3861 "
Bicarbonate of lithium	0.2209 grain.
Bicarbonate of magnesium	13.5532 grains.
Bicarbonate of calcium	24.3727 "
Bicarbonate of iron	trace.
Phosphate of sodium	"
Biborate of sodium	"
Alumina	"
Silica	1.9712 grains.
Organic matter	trace.
	1250.0411

Carbonic acid and sulphuretted hydrogen are given off in large amount at the springs.

In addition to the springs there are the natural vapor caves found in the cliffs at the mouth of the beautiful cañon of the Grand River, a few minutes' walk from the hotel. Springs boil up from the floors of these caverns and pour out vapor laden with sulphuretted hydrogen and sulphurous anhydride. A temperature of 112° F. is maintained in the caves by the heat given off from the water. The presence of large amounts of sulphur in the vapor is demonstrated by heavy deposits of that substance in a free state on the walls of the caves, this being probably effected by the mutual decomposition of sulphurous anhydride and sulphuretted hydrogen.

Physiological Action. It is often claimed that quite as effective results can be obtained from baths of plain hot water as from the use of the water of hot mineral springs, and that the apparent superiority of the latter is due mainly to the

change of climate and mode of living. Although change of climate and mode of living are certainly valuable and sometimes necessary adjuncts in the treatment of certain diseases, I am convinced by my experience at Glenwood that there are virtues in highly mineralized thermal waters that the plain baths of hydropathic institutions do not possess. The improvement noted in patients who were residents of Colorado and accustomed to an out-of-door life and fresh air, and in others who had received treatment in hydropathic establishments of high standing without relief, would seem to justify me in coming to this conclusion.

I am unable to give a satisfactory reason for any difference there may be in the relative merits of artificial and natural heat. The experience of Dr. Keyes, from personal observations made at the Hot Springs of Arkansas, may be of some interest in regard to this point. He says: "My own investigations showed me that a foot-bath at 110° F. was impossible. The feet could not possibly be retained in the water at that temperature, a thing perfectly possible (but not pleasant) at home in Croton water. A thermometer held in the mouth while making the attempt to take this foot-bath was raised to 103° F. An ordinary bath at 98° F. was unpleasantly hot, and caused perspiration to trickle from the forehead in streams, The immediate after-effect of the bath (unlike that from an ordinary bath) is one of exhilaration, followed in a couple of hours by reaction and a desire to sleep. The appetite improves under their use, and the ordinary functions seem to be performed better than when they are not used by the visitors to the place." If a mammal be placed in a hot bath which is three or more degrees higher than its own temperature, the excretion of carbonic acid and the consumption of oxygen are increased, owing to the stimulation of the metabolism (Pflüger), while for the same reason urea is also excreted in larger quantities (Schleich). It will also be observed that this increase of urea continues for several days after taking a series of such baths.

It is now well understood that the foregoing effects of pro-

longed hot and vapor baths are produced by the stimulation of the sensory cutaneous nerves, which exercise an important influence on the most complicated processes of the organism by means of the reflex actions transmitted through the central nervous system. Anything which tends, then, to intensify the stimulation of the peripheral nerves will favor greater activity of the different vital functions. That saline ingredients act as additional excitants may easily be demonstrated by noting the greater redness of the skin after a hot brine bath as compared with its appearance after a plain hot bath. Paalzow's experiments prove that a strong stimulation to the skin produces a reflex conversion of tissue indicated by an increased consumption of oxygen and excretion of carbonic acid. Brunton recommends the addition of common salt to the water to increase the stimulation of the skin and the amount of after-reaction. The gratifying results obtained at Glenwood I fully believe to be largely due to the decided stimulation of the skin occasioned by the extraordinarily large amount of mineral ingredients in the water. Liebermeister, Rembold, Paalzow, and Leichtenstern have been convinced by their experiments that the stimulus of the salts and gases usually employed in balneotherapy is commonly too weak to increase reflexly the conversion of tissue and the production of carbonic acid. "There is no perceptible influence on the beats of the heart," says Leichtenstern, "and no effect worth mentioning on the distribution of the blood, from the use of thermal indifferent baths (those containing a low percentage of salines), to which class most of those applied in balneotherapy belong. On the other hand, thermally indifferent baths (those with only a temperature of 93° to 95° F.) containing salts and gases in quantity may by their stimulation of the skin act as mild epispastics and occasion a slight expansion of the vessels of the periphery." Röhrig and Guntz found that when they immersed a rabbit in a three per cent. brine bath with a temperature of 96.8° F., there was a greater consumption (15.3 per cent.) of oxygen and a greater formation (twenty-five per cent.) of carbonic-acid gas, as compared with an equally long stay in

a simple water-bath of the same degree. These percentages rose higher and higher as the salt bath approached the point of saturation. Thus, the acceleration of oxidation kept pace with the increasing skin stimulation, due to the larger amount of saline constituents of the bath. In the light of such investigations by men of known ability we may not unreasonably look for the best results, other conditions being equal, from treatment at those springs the water of which has a temperature considerably over 100° F. and a very high percentage of mineral ingredients. The regular immersion in such water in conjunction with vapor baths, by stimulation of the cutaneous nerves, influences the finer processes of metabolism, as well as the secretions, distribution of the blood, movement of the lymph, etc. It is during these changes that pathological products, exudations, hyperplasias, new formations, and toxic agents are drawn into solution and eliminated from the system.

Before leaving this part of the subject, a few words are in place in regard to the action of the sulphur. In the majority of books it is claimed that, in spite of the strong impression made upon the sense of smell by the sulphuretted hydrogen evolved, the amount of sulphur in sulphur springs is really very small. Unfortunately, the volume of sulphurous and carbonic-acid gases escaping from the Glenwood waters has never been measured, but eye-witnesses are always impressed by the large amount which continually escapes, and the extensive deposits of free sulphur on the walls of the caverns would seem to indicate that the waters of these interesting springs are heavily laden with this constituent. Woods believes that "sulphur baths act by producing an excitant effect throughout the ultimate organic structure, substituting a new and self-limiting action for that previously existing; perhaps, as in the case of mercury and iodine, changing the very structure itself by stimulating the disintegrating process and causing a healthier nutritive deposition in the place of the diseased tissue removed. In other words, they are an alterative remedy." Sulphur baths also lower the morbidly increased irritability of the nerves, and a simultaneous use of the water for bathing and

drinking purposes promotes the flow of the secretions, especially the bile.

The vapor in the caves is used to accomplish the same objects as those obtained by the hot baths. The skin stimulation from this vapor is very marked, probably on account of the large amount of sulphurous and carbonic-acid gases contained, as well as from the heat. These gases, with the aid of the watery vapor, are in the best possible form to be absorbed by the skin, and come directly in contact with the termination of the nerves, producing a powerful stimulating effect on the glands of the skin as well as the rest of the economy, and a most profuse perspiration is the result. In the case of several persons who complained that Russian baths had not been able to excite the sweat glands to a desirable state of activity, a profound diaphoresis was effected by means of this vapor. This effect is found to be very useful in diseases of the skin and in those diseases in which it is desirable to eliminate lactic, uric, and fatty acids, urea, and other products of metamorphosis.

As a Drinking Water. The ingredients of the water which are of value for internal use are carbonic acid, sulphur, sodium chloride, and the laxative bicarbonates and sulphates.

The carbonic acid causes a feeling of warmth in the stomach and acts as a stimulant to the mucous membranes, nerves, and muscular fibres of the stomach and intestines, causing an increase of the gastric juice, exciting peristalsis, and improving the appetite. There is also an increased excretion of urine, due to the fact that carbonic acid accelerates the absorption of water by the mucous membrane of the intestinal canal (Voit.)

Sodium chloride stimulates the mucous membranes of the body, especially in the gastro-intestinal tract, dissolves mucus in the stomach, increases the secretion of the gastric, intestinal, and pancreatic juices and bile, favors the formation and absorption of peptones, and excites peristalsis. It plays an important part in the diffusion of fluids through the membranes, and its presence is necessary for the solution of the globulins (Landois and Stirling); it also increases the excretion of urea (Voit, Bischoff, Brunton). By the last-mentioned processes

the structures of pathological products become loosened, and their albuminates are carried away and converted into the ultimate product, urea (Voit, Flechsig.)

Sulphurous mineral waters containing earthy and alkaline sulphates are more or less laxative and diuretic when taken internally, while the sulphurous acid disengaged from them in the body promotes diaphoresis. Stifft (quoted by Baruch) believes that sulphuretted hydrogen has a specific excitant effect upon the sensory fibres of the pulmonary branches of the pneumogastric and upon the cardiac and vasomotor centres, its prolonged use giving rise to paralysis from over-stimulation. In this way he explains the action of sulphur water on the respiratory and circulatory systems, on tissue metabolism, and on the secretory and excretory functions.

A study of the effects of the climate, vapor bath, and the internal and external use of the water of Glenwood, shows that these various agents possess qualities in common which render them of value in the treatment of disorders in which the general condition of the patient is torpid, the tissue-changes sluggish, the functions difficult to stimulate, and in which the absorption and elimination of pathological products and deposits are desired.

Contraindications. In the use of such powerful agents caution is always advisable in selecting cases for treatment. Generally speaking, the patients who would be apt to do badly at Glenwood are those suffering from organic disease of the kidneys complicated with degenerative changes in the arteries or hypertrophy of the left ventricle, valvular lesions of the heart with poor compensation or diseased bloodvessels, epilepsy, acute inflammatory diseases, recent hemiplegias, menorrhagia, and metrorrhagia. Patients with valvular lesions with simple hypertrophy and good compensation, unaccompanied by renal or vascular complications, suffer no inconvenience whatever.

Therapy. The various resources of modern hydrotherapy and balneotherapy have received full attention at Glenwood, the different forms of douches, massage, tub and vapor baths, and a mammoth swimming-pool being resorted to as the occa-

sion requires. Excellent meals and special kind of diet are provided at the hotel.

URIC-ACID DIATHESIS. Ebstein and others have shown that the introduction of urates in solution into the tissues produces local irritation, and that urates in solution give rise to even more irritation than when in the solid form. In the condition generally known as the uric-acid diathesis it is usually considered that the excess of uric acid is due to some morbid process and that it is not the primary cause of the disturbance; but it is also recognized that the uric acid itself is capable of exciting irritation and doing harm to the tissues, and that it should be removed from the body and its production restricted. That the treatment at Glenwood is most appropriate to such cases seems to be borne out in my own case. For six or eight weeks before my arrival at Glenwood, though my previous health had been good, I had been the victim of the various symptoms that go to make up an attack of uricacidæmia, *i. e.*, frequent headaches, acid eructations, coated tongue, constipation, an insurmountable sleepiness after meals, mental depression, and irritability. The treatment consisted of a visit to the vapor cave every other day, the drinking of a glass of the water every morning before breakfast, and frequent swimming in the pool. The daily quantity of urea and uric acid was estimated for twenty days, using the hypobromite test for the former and Salkowski's method for the latter. The food before and during the treatment was about the same, consisting of a simple mixed diet. According to these analyses, the ratio of uric acid to urea at the beginning was 1 to 32. This must be considered an excessive amount of uric acid. To be sure, Haig puts the normal ratio at 1 to 33, but the consensus of opinion appears to be that his methods are at fault. The ratio after irregular fluctuations became 1 to 56 on the twentieth day, this really being about the normal relation of the two nitrogenous compounds. The improvement in my condition after the first week seemed to keep pace with the changes in the ratio, so that by the fourth week I felt as well as usual.

It has been affirmed that some mineral waters have a solvent

action upon uric-acid calculi. This I cannot believe, unless the uric acid is in the form of very minute particles. It is quite probable, however, that they interfere with the formation of fresh gravel. When the existence of the stones has been recognized, the simplest way of dealing with them is to adopt surgical measures for their removal, and after the operation the patient may resort to mineral springs to prevent a repetition of the disorder.

GOUT. The indications to be met in the treatment of this disease are the correction and prevention of the necrotic processes by the establishment of a more complete metabolism and by the elimination of uric acid, as well as the absorption of deposits about the joints. According to Roberts, Garrod, Duckworth, and others, the deposition of crystalline urates is not merely a concomitant to, but is the actual cause of the joint troubles. There are others, however, who dispute this theory and believe that uric acid is the result and not the cause of the morbid processes. Nevertheless, both recommend the time-honored measures to hasten the elimination of uric acid. The treatment of this disorder by means of mineral waters is most suitable and effective, for at the bathing resort the habits are regulated, the patient willingly submits to irksome treatment, lives in a pure and invigorating atmosphere, and enjoys abundant exercise. There is a remarkable unanimity of opinion in the literature of the subject as to the good results obtained at a suitable resort, and especially at hot sulphur springs. Senator believes that sulphurous waters containing sodium chloride and alkaline and earthy sulphates tend to remove the various disorders which stand in a more or less close degree of causal relationship to gout, either as precedents or concomitants, such as irregularities of digestion, gastric and intestinal catarrh, tendency to acidity, constipation, portal congestion, disorders in the urinary secretions, etc. He is also of the opinion that such waters exert a more immediate influence upon the gouty diathesis and uric acid dyscrasia, and that permanent benefit is derived from their influence on the exciting disturbances. E. Pfeiffer, of Wiesbaden, having subjected some healthy per-

sons to a series of twenty hot mineral baths, found no essential difference in the amount of uric acid eliminated. After treating gouty patients with the same course of twenty mineral baths, he found that the quantity of uric acid excreted by them was usually diminished fifty per cent. or more. He concluded that thermal waters have a very marked action in the prevention of gouty manifestations, and thinks that the saline constituents in them exercise an important influence distinct from the effect of heat itself, as ordinary hot baths have not the same influence. The mineral waters which exert the most powerful stimulant effect on the secretions and most vigorously promote the absorption of morbid products will render the best aid in attacking the deposits in and around the joints, the inflammatory thickening of the tissues, and consequent articular stiffness, dislocations, and contractions of tendons. The following is a fairly illustrative case:

L. K., aged thirty-eight years, of Telluride, Col. Two years ago the large toe of the right foot was swollen, painful, tender, and red. The condition disappeared in about two months under medical treatment. A year later the same symptoms came in the great toe of the left foot, then invaded the other toes, and finally the entire foot. The patient was worse in spite of treatment. June 14, 1895, he came to Glenwood with the condition unchanged; he was barely able to walk with the assistance of crutches.

Treatment. Tub-baths daily at a temperature of 105° F.; all medicine stopped.

July 5th. He walked about with some slight help from a cane.

10*th.* He went away almost cured, not being able to stay longer away from home.

Chronic Rheumatism. This disorder has usually progressed so far in patients who seek the help to be found at bathing-resorts that structural changes attended by proliferation and thickening of the synovial and periarticular connective tissues have taken place as a consequence of the chronic inflammatory irritation. The membranous elements of the articula-

tions in many of the cases have become rigid and perhaps coalesced with the soft parts lying over them. In old and obstinate cases the disturbances of nutrition may have extended to the bones and soft tissues surrounding the joints. Motion is interfered with, and the adhesions have occasionally given rise to complete ankylosis, which has persisted in spite of all ordinary treatment. According to Maclagan, lactic acid, although not the cause of rheumatism, is present in excess even in the chronic forms of the disease, and causes great irritation of the tissues, which have become more liable to disturbances on account of the inflammatory changes. As a general rule, the disease drags on for months or years, terminating in even the most satisfactory cases in a very imperfect recovery. The general health of these patients is often poor and calls for tonic remedies to improve their nutrition. The most efficacious treatment in correcting the extensive changes just referred to are the mineral baths, which have a good influence on the nutritive processes by dilating the bloodvessels and by increasing the excretion of lactic acid and other products of metamorphosis.

The natural springs capable of producing these effects are always noted for their high temperature. Senator was convinced of the greater value of waters rich in mineral matters, especially the concentrated brine springs, for stimulating absorption. Massage and douches are important factors in the treatment of this disease.

Mrs. McF., aged thirty-three years, of Fruita, Col. Feet became swollen, tender, and inflamed eleven years ago. At different times almost every joint of her extremities has been affected. Her trouble always became aggravated in the spring, and has grown steadily worse. She came to Glenwood one year ago and took forty-five vapor-baths in the cave. She received more relief from this than from any previous treatment, and has been almost free from the disorder until the following spring, when it again recurred. The attack was not so severe as previous ones, although she attended to her duties with difficulty.

June 12, 1895. *Physical examination:* Joints of fingers, hands, wrists, and ankles swollen; otherwise normal.

Treatment. Vapor-baths in the cave every other day for the first week, and then daily; water internally before breakfast.

July 12*th.* She has taken twenty-five baths. All swelling had disappeared from joints; very little pain. She probably felt even better after her return home, as that was her experience before.

Miss P. R., aged nineteen years, of Denver, in March, 1894, began to have swelling of hands and feet. In the summer of 1895 the joints were very much swollen and painful, but were somewhat better in the fall. The trouble grew worse than ever during the following winter. She was treated in a hospital in Denver without any improvement, so she came to Glenwood, April 29, 1895. At this time her feet and hands were much swollen and very painful, and her muscles were stiff. Locomotion very difficult; bowels constipated; appetite poor. She took tub- and vapor-baths regularly, and drank the water before breakfast.

June 17*th.* The swelling of joints was much less; she walked better; the bowels were regular and the appetite was good.

July 15*th.* She could walk a long distance without pain; all swelling had disappeared.

Mrs. E. S., aged forty-nine years, of Philadelphia. Her present trouble began nine years ago, with swelling of left arm and lower extremities. During the course of the attack large nodules appeared in various parts of the body. This was accompanied by mild febrile symptoms, a good deal of pain, and a red rash. The condition lasted about four weeks and was followed by considerable pain on exertion. Was improved at Clifton Springs by means of baths and wet packs. Since then she has had many attacks, affecting the muscles and joints all over the body. While coming West she had a severe attack at Denver about one month ago, and was confined to bed for three weeks. This time the pain was severe in the region of the sciatic nerves, and the knees and feet were swollen and

painful. The patient became improved enough by means of medicines, massage, and electricity to continue her journey to this place, but she was still almost completely disabled.

Physical examination: Aortic insufficiency; otherwise negative.

Treatment. Vapor cabinet baths daily, followed by hot douches over the affected parts; water internally before breakfast.

12*th.* She went away feeling almost well. She walked during the last two weeks without assistance.

20*th.* A letter was received from the patient stating that she continued to improve.

Rheumatoid Arthritis. The erosion of the cartilages, the eburnation and abrasion of the bones, the osteophytic formations around the articular surface, and the lesions of the synovial membranes, with the attending deformities, contractures, ankyloses, and atrophies which characterize this disease will fully test the efficacy of any form of treatment. It is safe to say that the majority of patients suffering from aggravated attacks of this ailment, who are able to bear the expense, sooner or later find their way to some bathing-place, after searching elsewhere in vain for relief.

When the patient is comparatively young and the disease has not run too long a course, proper treatment by means of appropriate mineral baths, if persisted in for a sufficient length of time, will be rewarded by gratifying results. In advanced cases, after the patient has reached middle age, the most favorable prognosis we can offer is that the progress of the disease may be retarded and that some of the complicating contractures and other deformities may be relieved. It is important to remember that in this disease the patient is apt to be in a "run-down" condition, and that in such instances drastic measures cannot be too strongly condemned. Local douches of hot mineral water combined with massage are still at our disposal in the treatment of such cases. Rademaker, of Aix-la-Chapelle, has found marked benefit to follow treatment by this means even in advanced cases, the general bath being used

when not contraindicated. My personal experience with this affection was confined to advanced and hopeless cases, and although the disability from contractures, etc., was considerably alleviated, they were not long enough under my care to note whether the improvement continued. Some very remarkable results obtained by my predecessor, Dr. Hobhouse, in younger patients with a less obstinate form of the disease, have been reported by Dr. L. R. Morris, in the *New York Medical Journal* for September 28, 1895.

It is of importance to instruct the patients suffering from rheumatism and gout that they will be liable to experience an increase of pain in the joints while taking the baths. This pain soon departs, as a rule, though in some cases it persists during the entire course. When it does come to an end, however, it leaves the patients in better condition than before, and they will probably enjoy immunity from attacks of rheumatism and gout during the following winter at least.

Gastro-intestinal and Hepatic Disorders. The waters of Glenwood taken internally, aided by their external use, worked well in gastro-intestinal disorders due to catarrh of the mucous membranes, torpor of the muscular coat, and deficient secretion. In obstruction of the portal circulation and catarrh of the bile-ducts the drinking of the water, combined with the mineral and vapor-baths, bracing air, and exercise, gave the most satisfactory results. Frerichs, in speaking of some of the European spas, says: "They are with difficulty replaced by any other remedies in cases where the jaundice owes its origin to chronic congestion of the liver, with obstinate catarah of the bile-ducts and mucous membrane of the stomach and duodenum, to gall-stones, etc."

Although it must be confessed that the evidence of the efficacy of mineral waters and alkalies in dissolving gall-stones is inconclusive and their value overrated, there can be little doubt that they improve the general health, lessen the tendency to acid dyspepsia, reduce congestion of the liver, and produce such changes in the bile as to lessen the chances of the formation of fresh concretions.

Murchison believes that solutions of the crystallized salts from natural spring waters do not, when dissolved in ordinary water, have the same effect as the mineral waters themselves, which contain other substances left out in the process of crystallizing. The same writer is of opinion that the waters are more efficacious when drunk at the springs than when used at home, and that they should be slowly sipped rather than swallowed at a draught. Zowilski (quoted by Murchison) found that sipping liquids not only increased the quantity of the bile, but caused it to be secreted under greater pressure, so that the secretion still occurred when its flow into the duodenum was obstructed. Following are a few of the cases treated:

J. L. S., aged sixty-one years, Buffalo Springs, Col., is a cattle ranchman, accustomed to outdoor life; yet in August, 1892, he became the subject of attacks of dizziness and vertigo. This was accompanied by eructations of gas and acid regurgitation. He vomited from one to three times a day. Insomnia from epigastric oppression was marked, and constipation was very obstinate. His weight was reduced from one hundred and twenty-seven to one hundred and eight pounds. Coated tongue, bad taste in mouth, poor appetite, sallow skin. He came to Glenwood in December, 1894, took cave baths, and drank one pint of the water before breakfast daily. His bowels soon became regular, and after twenty days' treatment he could eat anything. He gained twenty-six pounds in fifty days. He then slept well and all depression and anxiety had disappeared.

Mrs. S. R., aged twenty-three years, of Denver, has had indigestion since a child. It began to be severe when she was fourteen years of age. Her symptoms were eructations of gas, acid regurgitation, flatulence, rumbling of gases in the bowels, bad taste in the mouth, constipation, frequent abdominal pains, distress after eating, and insomnia. Sometimes she passed stringy mucus from the bowels. She came to Glenwood on June 1st, drank the water daily before breakfast, and took tub-baths.

July 3d. All symptoms of her trouble had gone, and she had a good appetite and slept well.

Mrs. W. E. C., aged thirty-five years, of Boston, has suffered every spring from attacks of catarrh of the bile-ducts and intestines. The attack for which she sought treatment began in the latter part of March, with constipation, loss of appetite, mental depression, lassitude, fermentation of food, and headaches. The patient did not improve in spite of medicinal treatment, and daily exercise, consisting of walking and horseback-riding. She arrived at Glenwood on June 9th, somewhat jaundiced. Treatment consisted of drinking the water before breakfast, daily cabinet-baths, douches over the region of the liver, and massage.

June 18th. The patient left entirely well. Her sallowness was all gone, and she had regained her natural cheerfulness.

D. C. S., aged thirty years, of Philadelphia. His trouble began in August, 1894, with severe pain in the right iliac region and constipation. The stools contained a great deal of mucus, and flatulence was marked. He had lost thirty pounds. He had tried lavage and had taken hydronaphthol, bitter tonics, and laxatives, yet there was no appreciable improvement.

Treatment at Glenwood commenced on July 3d, and consisted of two glasses of the water before breakfast, cave baths every other day, and moderate exercise.

August 10th. The bowels were regular; he had had no flatulence for some time, and felt invigorated and healthy; the complexion was clear.

Diseases of the Skin. The waters and vapor of Glenwood possess to a remarkable degree the property of unctuousness. While immersed and for some time after taking the baths the skin has a peculiar feeling of smoothness, as if it had been anointed with some very fine bland oil.

Hot sulphur baths should never be used in acute cases or in acute stages of chronic cases. The best results are obtained in the torpid or terminal periods of chronic cutaneous disorders. Sulphur seems to have a real influence over the

functions of the skin. Aside from its use as a parasiticide, it is beneficial in those affections in which general excitement is wanting and the local disorder has subsided into the obstinacy of habitual wrong action with very little or no tendency to acute inflammation. The hot baths soften, macerate, and cleanse the scales and crusts of the epidermis, stimulate the production of healthy skin, and improve the functions of the tissues. Not only are the local disorders relieved, but the functional and other disturbances causing them are removed or improved by the general tonic effects of the treatment. Senator especially recommends hot sulphur baths when the gouty state is complicated with affections of the skin. The cutaneous disturbances which have received most benefit at Glenwood are chronic eczema, acne vulgaris, psoriasis, seborrhœa, and the chronic scrofulous exanthemata.

Mrs. J. F., aged fifty-three years, of Des Moines, Iowa, had had occasional slight attacks of rheumatism and periods of nervous depression. Last winter the skin of her hands became red, scaly, thickened, and cracked, and continued so, notwithstanding many attempts to overcome this condition. She was constipated and subject to flatulence.

June 3d. She came to Glenwood and was put under treatment, which consisted of a tub-bath daily at a temperature of 105° F. and the drinking of the water before breakfast.

29th. She said this was the first time she had used any water that would regulate her bowels, although she had spent some time at Carlsbad.

July 15th. The skin of her hands had become smooth and soft and her general complexion was much clearer than when she came.

Dr. Hobhouse, when resident physician, suffered from a prolonged attack of boils, lasting over two months, which, he thinks, was due to the neglect of some small acne pustules. He finally resorted to the baths himself, and was thereafter free from the trouble. According to his experience, treatment by the bath and vapor was most valuable in the severer forms of chronic acne, associated with the formation of large

comedones and a good deal of surrounding inflammation, as well as in other morbid processes affecting the sebaceous and sweat-glands.

Bulkley believes that many cases of psoriasis have been greatly benefited by the use of remedial waters, but in order to obtain relief the visit must extend over a considerable length of time, as such treatment for a brief period, though possibly of temporary benefit, will not so modify the system of the patient as to prevent a return of the eruption when active measures are no longer employed.

SYPHILIS. This disease cannot be cured by the water and vapor alone at Glenwood; nevertheless they are powerful adjuncts to the regular forms of treatment. All the experience at Glenwood tends to prove this statement and coincides with the views of Leichtenstern, whose conclusions concerning the action of hot sulphur waters are as follows:

1. They excite the retarded eruption of roseola.

2. They give support to the specific cure and increase the power of the skin to take up mercury that is rubbed in. They raise the temperature of the body and assist the action of the mercury by increasing the decomposition of the albuminates.

3. They have a favorable influence in hastening the cure of certain affections of the skin, and also favor disappearance of affections of the glands, periosteum, bones, and nerves.

4. They are useful in cases of inveterate syphilis when patients are suffering from injudicious administrations of mercury and iodine, too long-continued cures, chronic mercurialism and iodism, and in those cases in which there is not constitution enough to respond further to mercury and iodine.

We may add to the above conclusions that these waters and vapor have been very useful in those cases in which mercury and iodine were not tolerated in sufficient doses. The efficacy of the Glenwood waters, and more especially of the vapor, in eliminating metallic poisons, have long been known to physicians in all parts of Colorado, who have been in the habit of sending their intractable patients suffering from lead-poisoning incurred at the numerous smelters, to these springs, where

they invariably obtain relief. Mironovitch has experimented to ascertain the amount of excretion of mercury through the sweat-glands, and has found it much better than was formerly supposed. He believes that when it is necessary to relieve the system of an excess of mercury a relatively larger amount can be eliminated by means of the perspiration than through the kidneys. The powerful excitation of diaphoresis and the consequent excretion of mercury probably explain some of the beneficial effects obtained by the treatment of syphilis at Glenwood. Dr. Hobhouse secured some gratifying results in treating obstinate cases, one of the most interesting of which has been reported by Dr. Morris in his article. There are no cases on my books that would be appropriate as illustrations, as the patients who came under my care were all suffering from tertiary forms, and, unfortunately, could not remain long enough to get the full benefit of the treatment. But, from the improvement noted in these instances, I felt certain that the disease would have been completely overcome if they had remained for a reasonable length of time.

In presenting this article I have confined myself closely to those diseases with which I have had personal experience at Glenwood, but good results have been reported by others in the treatment of certain nervous troubles, naso-pharyngeal catarrh, some forms of kidney disease, diabetes, obesity, and alcoholic and tobacco-poisoning. All medical men occasionally meet with aggravated and obstinate cases of chronic disorders which baffle every attempt, no matter how skilful, directed toward the restoration of health. Let me conclude by urging the discouraged physicians to send a few of their discouraged patients to this sanatorium of nature, and decide for themselves as to its merits.

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APPENDIX.

REPORT OF THE COMMITTEE UPON HEALTH RESORTS.

THE presentation of the following reports upon some of the health resorts of the United States began with an attempt to collect reliable data regarding these resorts which will be of service to the physician-at-large. It is proposed to continue this work from year to year as information can be obtained; and all members of the Association are urged to co-operate with the Committee in their exertions to discover health resorts, and obtain authentic facts concerning them. Lists of health resorts and the names of reliable persons at them with whom to communicate are especially desired. The especial class of diseases the various resorts were supposed to be favorable for has not, as a rule, been mentioned designedly, that being left for the physician to determine from the data given.

The first section of the report of the Committee on Health Resorts will be found in Vol. XI., published in 1895, pages 189–231.

The report of resorts are here given as follows:

Alabama—Greenville.

Arizona—Tucson.

Arkansas—Potash Sulphur Springs; Blanco Springs.

California—Napa Soda Springs; Ojai Hot Springs; Shasta Springs; Ætna Springs; Santa Barbara.

Florida—Pinellas Peninsula; Tarpon Springs.

Georgia—Bowden Lithia Springs.

Illinois—Perry Springs.

Indiana—French Lick Springs; Indiana Mineral Springs; West Baden Springs.

Kansas—Blazing Natural Medical Springs; Genda Mineral Springs.

Kentucky—Bedford Springs; Crab Orchard Springs.

Maine—Wilson Springs.

Maryland—Chattolanee Springs.

New Hampshire—Bethlehem; Colebrook; Crawford; Jackson.

New Jersey—Beach Haven.

New York—Lake Placid; Keene Valley; Paul Smith's; Luzerne.

North Carolina—Asheville.

Oregon—Lehman Springs; Wolfer's Mineral Springs.

Pennsylvania—Delaware Water Gap; Cresson; Bedford Springs; Ebensburg; Monterey Springs; Minnequa; Glen Summit.

South Dakota—Hot Springs.

South Carolina—Harris Lithia Springs.

Tennessee—Idaho Springs; Red Boiling Springs; Tate Epsom Spring.

Texas—El Paso.

Utah—Castilla Hot Springs.

Vermont—Burlington.

Wisconsin—Palmyra Springs; Shealtiel Mineral Springs.

ALABAMA.

Greenville, Butler Co. Greenville has an altitude of about 375 feet above sea-level.

The soil is very dry and stiff, with clay foundation. The maximum temperature is 85° F., the minimum 30° F. Mean temperature during summer is 80° F., during winter 55° to 60° F.

There are no high winds or fogs.

There are fully three hundred bright, sunny days during the year.

There are first-class hotels; their capacity for guests is from

50 to 100. Particulars may be obtained from Ehlbert House, Mrs. J. M. Steiner, Mrs. H. Z. Wilkinson.

The out-of-door attractions are hunting, fishing, driving, etc.

The advantages of this region as a health resort are its high altitude, dry soil, and pine forests. There is a very fine artesian well in the town of Greenville.

The following is an analysis of the Wilkinson's Matchless Mineral Water by A. L. Metz, M.D :

Equivalent to sodium chloride	5.083	grains.
Sulphuric acid	735.108	"
Iron (ferric) oxide	334.480	"
Iron (ferrous) oxide	101.920	"
Aluminum oxide	7.681	"
Calcium oxide (lime)	30	"
Magnesia	26 872	"
Potash	2.322	"
Soda	6.045	"
Silica	6.049	"
Color	Yellowish, red, and clear.	
Odor (when heated to 140 degrees)	Terebinthinous.	
Taste	Very astringent.	
Phosphates	Heavy traces.	
Chlorine as chlorides per U. S. gallon of 231 cubic inches	3.102	grains.
Carbonic acid	Not determined.	
The specific gravity of the water is	1.0070	

ARIZONA.

Tucson. The altitude of Tucson is 2400 feet. Altitude of Oracle, forty miles from Tucson, a fine resort, is 4600 feet.

Tucson has the lowest relative humidity of any city in the United States during the winter months. The average being about 42 per cent. The soil is all disintegrated granite débris, eroded from the neighboring mountains, and is from 1 to 300 feet deep. There is absolute drainage, even the rivers running underground. Mean annual temperature 70.9° F. (U. S. W. B., 1891). Extremes: maximum, 109° F.; minimum, 22° F. Fifteen days below freezing in December and 14 in January of the same year. As in all arid regions the days are much warmer than the nights. It has never been known to freeze in Tucson during the daytime. The atmosphere is excessively dry. Evaporation of exposed water being over 77 inches annually.

Average hourly velocity of wind 7.5 miles.

Seven gales in the year 1892. Highest recorded velocity of wind is 54 miles. The winds are not often disagreeable.

There has never been a fog in Tucson.

United States photographic records show an average of nearly ten hours daily sunshine, year in and year out.

The natives count nearly three hundred cloudless days in each year. I have never seen a day in Arizona on which the sun did not shine at some time. (M. A. R.)

There is moderate accommodation for strangers both by hotel and boarding-house, but the demand far exceeds the supply. There are also houses to be rented during the winter months, but they have to be engaged long in advance. So great is the need for accommodation here that the city will give either cash or equivalent for $20,000 for a $100,000 hotel or sanitarium. Address Miss Anna M. Hall, Underwood & Gibbon, and the Tucson Chamber of Commerce.

The mild winter weather, with clear warm dry days, fine roads, and good scenery, make out-door life very enjoyable during the cold months. There are no places of amusement except those created by nature. There are some interesting ruins, both prehistoric and of the old Spanish regime, which are interesting. San Xavier del Bac. Mission is the oldest cathedral in the United States, established in 1654. Tucson, first mentioned by Coronado, in 1539, twenty-six years before the Spanish landed at St. Augustine.

The particular advantages claimed for this region as a health resort are the intense aridity, moderate altitude, and *warm winter weather*. In 1891 the precipitation was a little over six inches. Nearly the entire rainfall occurred in August and December. The clinical evidence in favor of the climate is favorable. Many citizens having been tuberculous when they arrived have recovered. Cases of persistent neuralgia, rheumatism, and other diseases improve astonishingly. Genito-urinary tuberculosis does well during the winter months. Many people who have suffered for years from neuralgia have never had an attack after they came here, and are afraid to go away (Rodgers).

For full particulars in reference to the climate of Arizona, refer to article on "Climate of Arizona," in this volume, p. 88.

ARKANSAS.

Potash Sulphur Springs. Located six miles east of the Hot Springs, and one mile from Lawrence Station on the Hot Springs Railroad. The valley has an elevation of 650 feet, and the mountains rise to about 900 feet on both sides.

The soil is of gravel and red clay, and hence dries very quickly. There is an abundance of rain. Minimum temperature 23° F., maximum 94° F.; average temperature 72° F.

No high winds except in March, and very few fogs.

There are hotel accommodations, the capacity for guests from 75 to 90.

The out-of-door attractions are fishing, quail shooting, boating, swimming; also large natatorium in connection with hotel, billiards, etc.

It is claimed that the potash sulphur water is a specific for all diseases arising from an excess of acidity in the system.

Analysis of the water is as follows:

1. A small quantity of free sulphurated hydrogen.
2. Sub. carb. of soda. and potassium.
3. Chloride of sodium (salt).
4. Sulphuret of sodium or potash.
5. Sulphates of magnesia and soda.
6. Bicarbonate of lime.
7. Bicarbonate of magnesia.

Blanco Springs. Altitude is 603 feet. It is situated thirteen miles higher up the river than the Hot Springs valley.

The country is broken and mountainous; the soil is dry and porous.

High winds, hurricanes and tornadoes during the winter season and during March, April, and May. Dense fogs are frequent in the winter and spring.

Hotel accommodations are rather scanty; capacity for guests 15.

Its altitude is claimed as an advantage as a health resort.

Analysis of Blanco water shows it to contain potassium, sodium, calcium, and magnesium salts, free carbonic gas, and phosphoric acid. It is free from organic matter, and entirely free from iron salts.

CALIFORNIA.

Napa Soda Springs. About 1000 feet above sea-level.

The soil is dry and porous down to bed-rock, which is near the surface. Winter: maximum temperature 60° F., minimum 40° F.; summer: maximum temperature 80° F., minimum 60° F. Rain only during the winter season.

Strong winds from the north, but no cyclones or whirlwinds. Fogs mainly from the ocean; are rare.

At least 325 bright, sunny days during the year.

Good hotel accommodations, but no facilities for buying houses or keeping house. Capacity for guests 250. Further particulars can be obtained from Andrew Jackson.

The attractions for out-of-door life are those of a first-class pleasure resort, including hunting and fishing.

Napa Soda Springs is claimed to be a good health resort for those troubled with asthma, bronchitis, and pulmonary affections generally. After a two years' examination of the claims of all portions of the State, the legislative committee of physicians selected the East Napa range as the best place for founding a hospital for the relief and cure of consumption.

ANALYSIS OF SPRINGS AT NAPA SODA SPRINGS.

Constituents.	Pagoda Spring, analyzed by Winslow Anderson, 1888. Temp. 67.7° F. Grs. per U.S. gal.	Iron Spring, analyzed by Prof. Lanzwood, 1870. Temp. 68° F. Grs. per U.S. gal.	Lemon Spring, analyzed by Winslow Anderson, 1889. Temp. 66.9° F. Grs. per U.S. gal.
Sodium chloride,	7.14	5.20	4.72
Sodium bicarbonate,	12.95	13.12	15.24
Sodium carbonate,	1.10	....	4.65
Sodium sulphate,	1.62	1.84	0.76
Potassium bicarbonate,	trace	....	....
Potassium salts,	....	....	traces
Magnesium bicarbonate,	3.04	....	....
Magnesium carbonate,	21.76	26.12	25.19
Calcium carbonate,	9.55	10.83	8.97
Calcium bicarbonate,	0.78	....	....
Ferrous carbonate,	7.90	7.84	8.11
Lithium,	....	....	trace
Boric acid,	....	....	trace
Alumina,	0.57	0.60	0.74
Silica,	0.74	0.62	0.83
Organic matter,	trace	....	traces
Total solids,	67.15	66.17	69.21
Gases.	Cubic inches.	Cubic inches.	Cubic inches.
Free carbonic gas,	143.62	Not determined.	95.79

Matilija or Ojai Hot Springs, Matilija, Ventura Co. The altitude is 1100 feet.

The soil is dry and rocky, the land being irrigated for agricultural purposes. Maximum temperature 100° F., minimum 32° F.

There are no fogs, and the place is sheltered from winds by the surrounding hills.

About 300 days are bright and sunny.

Cottages are to be rented and board and rooms to be obtained. Capacity for guests 60 in winter, 500 in summer. For particulars address A. W. Blumberg.

Out-of-door attractions consist of riding, driving, fishing, etc.

The climate is healthful and comfortable, no extremes of climate; it is about eight miles from the coast.

The scenery around Matilija is very picturesque, some of the mountains rise to a height of 2000 feet; there are caves, falls, cañons, etc.

Shasta Springs, Siskiyou Co. Shasta Springs is about 3200 feet above the level of the sea.

The soil is very dry and porous. Temperature varies about 20° F. during the day; extreme heat is 95° F.

There are no fogs nor winds.

Three-fourths of the days in the year are bright and sunny.

Accommodations for visitors consist of a fine system of cottages furnished for housekeeping; also first-class boarding-houses. Capacity for guests is 100. For particulars apply to E. S. Tomlin, Superintendent, Shasta Springs, Cal.

The out-of-door attractions are fishing, hunting, etc.

The advantages claimed for this region as a health resort are pure dry air, beautiful scenery, pure cold water—both mineral and non-mineral. It is in sight of Mount Shasta, 14,442 feet high. The mountain is about six miles from the springs.

The mineral water is carbonated chalybeate.

Ætna Springs, Napa Co. Ætna Springs is 1000 feet above sea-level.

Average temperature about 55° F.

There are high winds during storms, but no fogs.

Good hotel accommodations; also cottages to rent, with board.

The out-of-door attractions consist of tennis, swimming, walks, drives, etc.

The medicinal properties of water and the climate are claimed as advantages of the place as a health resort.

ANALYSES OF SPRINGS AT ÆTNA SPRINGS.

Constituents.	Ætna Soda Springs. Analysis by Winslow Anderson, 1888. Temp. 98° F. Grains per U. S. gal.	Alkaline Springs. Analysis by J. A. Bauer, 1878. Temp. 98° F. Grains per U. S. gal.
Sodium chloride	28.75	29
Sodium carbonate	73.06	75
Potassium carbonate	13.23	...
Magnesium carbonate	....	14
Calcium carbonate	8 94	10
Ferrous carbonate	0 05	trace
Sodium sulphate	0.56	8
Potassium sulphate	0.56	trace
Magnesium sulphate	0.45	...
Silica	0.09	trace
Organic matter	trace	...
Total solids	134.17	136
Gases.	Cubic inches.	Cubic inches.
Carbonic-acid gas	63	58

Santa Barbara. Santa Barbara, situated in the southern part of California, has an altitude of about 300 feet, the residential part of the town rising from the neighborhood of the sea to 300 feet above it. Scattered residences at higher elevations. Majority of boarding-houses and hotels from 150 to 250 feet above sea-level.

The soil is not as light as alluvial soil of inland valleys, although largely alluvial. In parts has a (more or less) mixture of adobe. It is very dry, so that no dampness occurs in closed houses. For the year 1895 the mean temperature was 59.6°. Three winter months, 54.2° F.; three summer months, 64.2° F.; three spring months, 57.2° F.; three fall months, 63° F. Highest temperature 91° F., November 19th; lowest temperature 37.5° F.

The temperature was above 80° for 22 days: 1 in May, 2 in June, 8 in September, 3 in October, 7 in November, 1 in December.

The temperature was below 40° F. for 15 nights: 6 in January, 1 in February, 5 in March, 3 in December.

Mean relative humidity 71 to 73. Highest in July, lowest in November. In three winter months relative humidity 68.3 in 1895.

In eight months, from October to May inclusive, 150 clear days.

In the year 231 clear days. Fair 63 days, cloudy 71 days.

Rain on 20 days, chiefly in December, January, and March. Total rainfall 11.69 inches, more often at night: January 6.25, February 0.67, March 1.97, April 0.46, May 0.02, June 0.05, July–September none, October 0.55, November 0.77, December 0.93.

Morning fogs are rather frequent in spring—April and May—and at times in early summer; they are mostly "high fogs," which temper the heat of the sun before the breeze comes up. The relative humidity is not increased during the months when they are most common.

There are occasional northerly winds; once or sometimes twice yearly a warm and high, dry wind coming through the mountains from the desert. Prevailing wind is the northwest trade current prevalent in California, but modified by the peculiar situation of Santa Barbara, from northwest to southeast. Winds are generally refreshing and invigorating.

The hotels are fair, with a near prospect of a new first-class tourist's hotel. Boarding-houses abundant and excellent. Rates fair; somewhat higher at the time of the flower carnival in April. It is easy to obtain houses by renting or purchase. Housekeeping is, on the whole, cheaper than in Eastern cities, and can be made very moderate in expense. Address Mr. W. W. Benton.

Among the attractions are riding and driving, which pleasure can be had at reasonable rates. The drives are varied and charming. Beach and bathing, "Country Club," with golf,

tennis, etc., amateur and professional concerts, mountain climbing, good library, and pleasant and informal society.

The advantage claimed for this as a health resort is its out-of-door life, which is possible throughout the year in all parts of southern California, and more comfortable and healthful in Santa Barbara from its more equable climate and freedom from excessive summer heat. The place is unequalled in variety of rides and drives and beach and mountain scenery.

FLORIDA.

Pinellas Peninsula. Situated between Tampa Bay and the Gulf of Mexico, below 28° north latitude. This portion of the State is favorably known as a health resort. It affords a distinctly insular climate, excellent accommodations for visitors, and an opportunity for a permanent residence superior in many respects to that found in other portions of the State. The chief settlement on the peninsula is at St. Petersburg, population 1500; distant by water ten miles from Port Tampa, and connected by rail with roads leading to the north. The principal industries are raising fruits and vegetables for Northern markets, for which the soil is especially adapted. The sponge fisheries are remunerative, and food fish are shipped in large quantities from this port. The principal amusements are sailing and fishing for tarpon, etc. Living is inexpensive; good land sells for about fifty dollars an acre. There are nine churches, graded schools, and five hotels. For particulars address Major L. Y. Jennes, President Chamber of Commerce, St. Petersburg; William Macleod, President St. Petersburg National Bank.

Meteorological summary, Tampa, Florida, for the year ending October 31, 1894:

	November.	December.	January, 1894	February.	March.	April.	May.	June.	July.	August.	September.	October.
Highest temperature .	85	82	80	80	37	89	93	93	93	92	93	89
Lowest temperature . .	40	38	31	36	39	54	53	65	70	69	65	51
Range absolute	45	44	39	44	48	35	40	28	23	23	28	32
Precipitation, inches . .	2.73	1.32	1.42	2.73	1.71	1.36	6.92	9.15	11.56	7.16	17.28	4.84
No. of clear days . . .	7	11	5	8	8	10	8	5	3	5	9	9
No. partly cloudy days .	17	17	24	14	20	19	22	22	25	21	11	15
No. cloudy days . . .	6	3	2	6	3	1	1	3	3	5	10	7
Average humidity, per ct.	85	84	84	84	80	76	76	83	83	81	86	86

Seasonal temperature from twenty-five years' observation: Spring, 72° F.; summer, 80° F.; autumn, 73° F.; winter, 62° F.

Seasonable rainfall from fifteen years' observation: Spring, 8.55 inches; summer, 28.24 inches; autumn, 10.63 inches; winter, 8.04 inches.

St. Petersburg is eighteen miles from Tampa, and about ten miles further south; the difference in situation is such that the former averages several degrees cooler in summer and warmer in winter.

The climate is singularly equable and uniform, the difference between summer and winter being very slight, and the range of the thermometer during the year confined within very narrow limits. There is immunity from fog, and there is said to be no malaria.

Tarpon Springs. This is a famous resort for sports at the upper end of the Pinellas Peninsula, and affords good accommodations and a climate similar to that already described.

For information address Dr. W. B. Guthrie or Rev. S. B. Currier.

GEORGIA.

Bowden Lithia Springs, Lithia Springs, Douglas Co. The altitude is about 1200 feet above sea-level.

The soil is very porous. The temperature in summer is not above 90° F., in winter not below 40° F. The atmosphere is comparatively dry.

There are occasional high winds but little fog, and but few cloudy days in the year.

Very good hotel accommodations are to be had. Information can be obtained from J. A. Humphrey, Anstell, Ga., and John H. Lonch, Lithia Springs, Ga. Capacity for guests is 1000.

The attractions out-of-doors are hunting, fishing, driving, etc.; those of in-door life are billiards, bowling, tennis, etc.

The advantages claimed for this place as a health resort are its high altitude and dry atmosphere.

ANALYSIS OF BOWDEN LITHIA SPRINGS BY R. OGDEN DOREMUS.

	Grains per gal.
Calcium bicarbonate	17.247
Magnesium bicarbonate	2.874
Lithium bicarbonate	4.447
Ferrous bicarbonate	0.216
Sodium chloride	121.783
Sodium sulphate	8.032
Potassium sulphate	1.466
Aluminum sulphate	0.530
Strontium sulphate	1.226
Calcium sulphate	12.153
Magnesium bromide	1.732
Silicic acid	1.263
Iodine, manganese, phosphoric acid, boric acid	traces
Rubidium by spectroscopic analysis	traces
Loss on ignition	5.749
Solid residue by calculation	178.718
Total solids dried at 130° C.	171.925
Carbonic acid in bicarbonates	9.911
	181.836

ILLINOIS.

* *Perry Springs, Pike Co.* The soil is rich and of medium dryness. In summer the temperature is from 60° to 90°F.; average temperature about 70° F.

No high winds.

The greater number of days in the year are sunny.

There are good hotel accommodations and facilities for renting houses near the springs. Information can be obtained from R. R. Gregory, Perry, Ill.; N. Wilkins, Perry, Ill.; J. Morton, Perry, Ill. The capacity for guests is 300.

ANALYSIS OF SPRINGS AT PERRY SPRINGS BY DR. ENGLEMAN.

	Iron Spring, grs. per gal.	Magnesia Spring, grs. per gal.	Sulphur Spring, grs. per gal.
Calcium bicarbonate	15.89	19.75	19.66
Magnesium bicarbonate	14.01	14.81	10.49
Iron bicarbonate	0.55	0.40	0.27
Potassium and sodium silicate	2.54	2.28	3 45
Aluminum silicate	......	......	0.27
Sodium chloride	6.12	0.32	0.58
Sodium silicate	0.44	1.10	1.49
Potassium carbonate	1.59	1.45	1.46
Totals	41.24	40.17	37.67

No organic matter.

INDIANA.

French Lick Springs. The altitude is about 500 feet above sea-level.

The soil is sandy loam, underlaid by limestone; surrounding hills are from 200 to 300 feet in height.

First-class hotels and boarding-houses; also facilities for keeping house at reasonable expense. Particulars from William E. Ryan, M.D.

Out-of-door attractions are hunting, fishing, driving, tennis, etc.; also ball-grounds and fine bicycle track. The well-known mineral water, sulphur, and mud-baths, under medical direction, and fine scenery are claimed as particular advantages.

ANALYSIS OF SPRINGS AT FRENCH LICK SPRINGS BY E. T. COX.

	Pluto Spring. Grs. in imperial gal.	Proserpine Spring. Grs. in wine gal.
Sulphate of lime	15.6221	141.000
Sulphate of magnesia	6.6808	29.330
Carbonate lime	40.1800	20.200
Carbonate soda	4.7964	10.527
Carbonate magnesia	52.7100	4.500
Carbonate iron and alumina	....	2.500
Chloride sodium	141.8928	99.620
Chloride potassium	....	5.010
Chloride magnesia	6.0967	8.004
Silica	....	1.700
Silicic acid	0.6594	....
Oxide iron	0.1330	....
Sulphate soda	4.0712	36.720
Sulphate potash	1.2117	....
Sulphate alumina	5.9822	....
Carbonate potash	3.3236	....
Chloride calcium	32.9028	....
Iodides and bromides	trace	....
Loss	....	1.470

Gases.	Cubic inches.	Cubic inches.
Sulphuretted hydrogen	....	17.00
Carbonic acid	7.337	10.116
Sulphydric acid	6.717	....
Oxygen	5.407	....
Nitrogen	18.684	....

Indiana Mineral Springs, Warren Co. High winds not frequent and no fogs.

Hotel accommodations; capacity 250. Cottages can be rented for the summer. Information can be obtained from H. L. Kramer, Indiana Mineral Springs, Indiana, or Indiana Springs Co., 45 Randolph St., Chicago, and 105 Hudson St., New York.

Out-of-door attractions are fishing, driving, etc.; in-doors, music, entertainments, etc.

The particular advantages claimed are the magnetic mineral mud-baths, and Puritan lithia water, both for baths and drinking purposes, under competent medical direction.

Qualitative analysis of the Puritan Springs water develops the presence of lithium in sufficient quantity to render the water valuable medicinally.

The following analysis is by H. A. Huston:

COMPOUNDS IN 100,000 PARTS OF WATER.

Sodium chloride	0.568
Sodium sulphate	3.022
Sodium carbonate	1.894
Calcium carbonate	21.073
Magnesium carbonate	8.778
Silica	1.656
Gases.	Cubic inches.
Carbonic acid	6 53
Oxygen	1.05
Nitrogen	4.46
Total	12.09

The gases dissolved in water, results stated in cubic inches per gallon at 0° C. and 720 mm. pressure.

West Baden Springs, West Baden, Orange Co. The altitude is about 900 feet above the sea.

There are no high winds nor fogs.

About two-thirds of the days in the year are bright and sunny.

First-class hotel, with a capacity of 1000; also boarding-house in the village.

Out-of-door amusements are hunting, fishing, driving, etc.

Fine air and the mineral waters are the advantages of the place as a health resort.

The following analyses are by E. T. Cox.

Analysis of Spring No. 1 from West Baden Springs.

Solids.	Grains per gal.
Silicic acid	0.5250
Oxide of iron	0.1050
Sulphate of lime	13.4190
Sulphate of soda	3.7296
Sulphate of potassa	1 6436
Sulphate of magnesia	43.3881
Sulphate of alumina	5.4096
Carbonate of lime	49.6601
Carbonate of soda	1.3356
Carbonate of potassa	0.7497
Carbonate of magnesia	47.0036
Chloride of calcium	8.7346
Chloride of sodium	93.6026
Chloride of magnesia	13.6878
Iodides and bromides	trace
Total	282.9939

Gases.	Cubic inches per imp. gal.
Carbonic acid	7.447
Sulphuric acid	6.821
Oxygen	6.027
Nitrogen	20.271
Total	40.566

Spring No. 3.

Solids.	Grains per gal.
Carbonate of lime	31.240
Carbonate of iron	2.124
Carbonate of soda	10.520
Carbonate of magnesia	43.460
Sulphate of lime	43.627
Sulphate of soda	14.406
Sulphate of magnesia	53.570
Chloride of sodium	127.810
Chloride of potassium	12.415
Chloride of magnesium	7.753
Total	346.925

Gases.	Cubic inches.
Carbonic acid	6.124
Sulphuric acid	3.215
Nitrogen	16.137
Oxygen	5.465
Total	30.941

Spring No. 5, Blue Mass Spring.

Solids.	Grains per gal.
Sulphate of lime	130.074
Sulphate of soda	38 127
Sulphate of magnesia	33.335
Carbonate of lime	22.350
Carbonate of soda	11.640
Carbonate of magnesia	7.257
Carbonate of iron and alumina	3.607
Chloride of sodium	97.456
Chloride of potassium	7.358
Chloride of magnesium	11.037
Total	362.241

Gases.	Cubic inches.
Carbonic acid	11.116
Oxygen	6.347
Nitrogen	19.174
Sulphuric acid	2.505
Total	39.142

Spring No. 7, New Spring.

Solids.	Grains per gal.
Sulphate of lime	86.011
Sulphate of potassa	0.843
Sulphate of alumina	2.573
Sulphate of soda	28.857
Sulphate of magnesia	48.798
Carbonate of lime	34.467
Carbonate of potassa	0.635
Carbonate of iron	2.945
Carbonate of soda	9.687
Carbonate of magnesia	32 784
Chloride of calcium	7.854
Chloride of sodium	108.318
Chloride of magnesia	13.102
Chloride of potassium	11.873
Total	383.747

Gases.	Cubic inches.
Carbonic acid	8.296
Nitrogen acid	18.274
Sulphuric acid	4.205
Oxygen	6.147
Sulphuretted hydrogen	9.987
Total	46.909

Greenwood Sanitarium, Greenwood, Johnson Co. Altitude 831 feet above sea-level.

Soil is retentive of moisture, but sufficiently undulating for surface drainage. It is said to be the best tile-drained section in the State. Maximum temperature 90° F., minimum 12°

F. Relative humidity 55 per cent. Mean annual temperature 54° F.

One-half of the days in the year are bright and sunny.

Hotel and boarding-house accommodations; also facilities for buying or renting houses. Capacity for guests is 150. Reference is made to William M. Corson.

Advantages claimed for this place as a health resort are its mineral wells, its high altitude, dry atmosphere, and good roads.

In-door amusements are concerts, lectures, and other entertainments. There is electric railway communication with Indianapolis.

Qualitative analysis of the mineral water; the bases are: sodium, magnesium, calcium, iron, and aluminum. The acids found are hydrochloric, sulphuric, carbonic, silicic, and hydrosulphuric.

KANSAS.

Blazing Natural Medical Springs, Manhattan, Riley Co. The altitude is 1014 feet above sea-level.

ANALYSIS OF NATURAL MEDICAL SPRING.

	Well No. 1. Gr. U. S. gal.	Well No. 2. Gr. U. S. gal.
Calcium oxide (as bicarbonate)	5.2799	6.0749
Calcium oxide (as sulphates and chloride)	33.3673	....
Calcium oxide (as sulphate)	....	14 6900
Magnesium oxide (as sulphate)	5.6561	....
Magnesium (as sulphate)	....	6.5824
Iron (bicarbonate)	0.1865	0.2483
Sodium (chloride)	0.5183	0.8648
Potassium	trace	trace
Chlorine	1.4644	1.7993
Sulphuric acid (anhydrous)	....	33.1141
Bromine	trace	....
Silica	10 0998	10.1851
Lithium	trace	....
Total solids in grains per U. S. gal.	117.9314	73.5586

The soil is porous. High winds and fogs are rare. Most of the days in the year are bright and sunny.

There is a boarding-house, and facilities for purchasing or renting at reasonable prices. Information can be obtained from Dr. E. L. Patee, Messrs. E. B. Purcell, M. C. Helder, Carl Engle, Chet. Carlton, Garrison & Elliot, of Manhattan, Kansas.

Out-of-door attractions are hunting, etc.

The fine air and mineral waters are claimed as the advantages of this place as a health resort.

Geuda Springs, Cowley Co. The altitude is about 1300 feet above sea-level.

The soil is dry and of excellent quality.

Occasional high winds, but fogs are rare.

About three hundred days in the year are bright and sunny.

Good hotels and boarding-houses; capacity for guests is 300. Facilities for renting apartments. Information may be obtained from Hon. C. R. Mitchell, Messrs. C. H. Tripler and C. S. Stokes.

The out-of-door attractions are fishing, hunting in season for birds, boating on Salt Lake, etc.

The dry, mild climate and waters are claimed as advantages of this place as a health resort.

Analysis of Geuda Springs Mineral Waters by Prof. Bailey, of Kansas University.

Solids.	Spring No. 1. Grs. per gal.	Spring No. 2 Grs. per gal.	Spring No. 3. Grs. per gal.	Spring No. 4. Grs. per gal.	Spring No. 5 Grs. per gal.	Spring No. 6. Grs. per gal.	Spring No. 7. Grs. per gal.
Sodium chloride . . .	1030. 935	1056. 284	815. 683	671. 765	377. 056	432. 201	504. 217
Calcium sulphate . . .	199. 640	204. 734	167. 588	158. 299	145. 881	147. 336	160. 170
Magnesium sulphate .	25. 561	24. 245	28. 535	26. 645	24. 983	24. 433	22. 868
Magnesium chloride .	16. 556	19. 968	10. 013	7. 901	8. 456	4. 957	9. 669
Calcium bicarbonate .	3. 709	5. 908	5. 998	6. 864	10. 678	12. 503	5. 517
Potassium sulphate . .	2. 123	1. 691	1. 907	1. 907	0. 828	0. 542	0. 478
Sodium phosphate . .	0. 023	0. 023	0. 023	0. 029	0. 041	0. 082	0. 082
Sodium bromide . . .	0. 023	0. 024	0. 018	trace	......	......	......
Sodium iodide	trace	......	trace	......	......	......	......
Sodium biborate . . .	0. 169	0. 169	0. 169	0. 087	0. 128	0. 128	0. 251
Sodium nitrate	0. 385	0. 408	0. 181	......	0. 029	0. 035	0. 035
Sodium bicarbonate . .	0. 414	0. 321	0. 391	0. 694	0. 490	0. 313	0. 601
Sodium sulphide . . .	......	......	......	......	......	0. 644	......
Lithium chloride . . .	trace	trace	trace	trace	trace	trace	trace
Iron bicarbonate . . .	0. 079	0. 179	0. 075	0. 057	0. 037	0. 061	0. 088
Alumina	0. 064	0. 019	......	0. 012	0. 011	......	0. 011
Silica	0. 671	0. 868	0. 817	0. 793	0. 921	0. 735	0. 799
Organic matter	trace	trace	trace	trace	trace	trace	trace
Total	1280. 352	1314. 857	1031. 203	875. 054	549. 539	626. 970	704. 784
Gases.	Cub. in.	Cub. in.	Cub. in.	Cub. in.	Cub. in.	Cub. in.	Cub. in.
Free carbonic acid . .	34. 956	27. 692	18. 917	17. 642	23. 983	22. 158	29. 048
Sulphuretted hydrogen gas	......	......	......	......	......	trace	trace
Specific gravity . . .	1. 018	1. 016	1. 012	1. 012	1. 008	1. 009	1. 009
Temperature	63¼° F.	63¼° F.	63½° F.	63° F.	63° F.	63¼° F.	63¼° F.

Kentucky.

Bedford Springs, Bedford, Trimble Co. Altitude is 466 above the Ohio river, which is six miles distant.

High winds and fogs are rare.

Seventy per cent. of the days in the year are bright and sunny.

There are hotel accommodations at the springs; capacity for guests is 200. No facilities for renting houses close to the springs. Information can be obtained from W. J. Parker, Bedford, Ky.

The out-of-door attractions are hunting, fishing, and fine scenery.

The healthy location of the springs is claimed as an advantage as a health resort.

Crab Orchard Springs, Crab Orchard, Lincoln Co. Altitude is 919 feet above sea-level.

The soil is dry, and the temperature neither very hot in summer nor cold in winter.

There are occasional high winds and fogs.

Seventy-five per cent. of the days in the year are bright and sunny.

First-class hotel accommodations; also facilities for renting or buying houses. Capacity for guests 600.

Out-of-door attractions consist of hunting, fishing, and driving.

Maine.

Wilson Springs, North Raymond. The altitude is about 600 feet above sea-level.

Soil sandy, dry, and porous. Atmosphere generally dry.

High winds at times, but fogs are rare.

Over two-thirds of the days in the year are bright and sunny.

There are first-class hotels and boarding-houses; also facilities for buying or renting comfortable houses. For particulars apply to Charles E. Small, Wilson Springs, North Raymond, Me. Capacity for guests 150 at Wilson Springs Hotel.

Out-of-door attractions consist of fishing, hunting, boating, and driving.

The high altitude of the place and the purity of the spring water are claimed as the advantages as a health resort; the air is pure and dry, free from malaria, etc.

MARYLAND.

Chattolanee Springs, Chattolanee, Baltimore Co. The altitude is 520 feet above the sea-level.

The soil is dry and micaceous.

No cyclones nor hurricanes; few fogs.

Good hotel accommodations; also cottages. Capacity 300.

The advantages as a health resort are the fine air, beautiful scenery, and pure water from six springs, with a flow of one million gallons per day.

ANALYSIS OF CHATTOLANEE SPRINGS BY MESSRS. LEHMAN AND MAGER. TEMPERATURE 52° F.

Matter in suspension	No trace.	
Ammonia	" "	
Organic matter	" "	
Nitric acid	" "	
One gallon contains inorganic matter	8.289	
Consisting of magnesium carbonate	1.812	grains.
" magnesium chloride	0.214	"
" lithia	trace	
" potassium sulphate	0.103	"
" silica	0.244	"
" carbonic anhydride and monocarbonates	1.106	"
" calcium carbonate	4.620	"
" sodium chloride	0.109	"
" sodium sulphate	0.081	"
" iron oxide	trace	
Total	8.289	grains.

NEW HAMPSHIRE.

Bethlehem. Situated in the White Mountain region of New Hampshire in proximity to the great Presidential range, 1450 feet in altitude. It is easy of access and a very attractive region. It is a summer resort, and the season extends from July 1st to October.

For ten years the mean maximum and minimum temperature was as follows:

	Maximum.	Minimum.	Mean.	Mean relative humidity.
July	83°	51°	66.04°	64.30 per cent.
August . . .	84	49	65.34	64.54 "
September . .	82	45	63.36	64.40 "

Fogs are quite frequent in the early morning in the valley, but seldom rise to Bethlehem.

High winds seldom or ever occur during the season. During the months of July, August, and September there are 95 per cent. of bright sunny days.

There are numerous first-class hotels and boarding-houses at various prices.

For particulars apply to Dr. C. F. McMahan, Bethlehem, N. H.

The attractions are mountain walks, drives, golf, fishing, tennis, etc. There is a fine casino at Bethlehem.

The particular advantages claimed for this region are the pure mountain air and cool temperature. Bethlehem is preeminent as giving immunity from and benefiting hay fever.

Dixville Notch, Colebrook. Situated sixteen miles from the Canadian border in a northern spur of the White Mountains. Altitude 2000 feet. "The Balsams" is a secluded mountain resort, well kept, two miles from other habitations, and ten miles from the railroad at Colebrook. The situation is especially suitable as a resort for subjects of hay fever. The trout fishing is good, the scenery wild, and the air exhilarating.

Crawford, elevation 2000 feet; Jackson, 1000 feet; Intervale and North Conway, at lower elevations, are desirable locations, well provided with hotels. Jackson is three miles from the railroad, and has one of the most luxurious and expensive, as well as plainer but perfectly comfortable houses. Golf is one of the attractions here. Address S. H. Thompson or General M. C. Wentworth, Jackson, N. H.

NEW JERSEY.

Beach Haven. Beach Haven is situated in Ocean County, N. J., on Long Beach, about five miles from the main upland,

and hardly more than 20 feet above sea-level. It is reached by railway without change of cars from Philadelphia, seventy-six miles distant, in three hours.

Being but a sand-bank deposited upon an old meadow formation, there is no accumulation of water except in holes. During the months of June to September the extremes of temperature are from 45° to 90° F. The humidity is that of the atmosphere alone, owing to the porosity of the soil, which is less than at most seaside places. The absence of mould, which is general, proving the dryness.

There is generally more or less wind, sometimes violent gales, but short-lived in summer.

Fogs are comparatively rare.

The average of bright sunny days is said by one who has had thirty years' observation to be very large, at least through the summer months.

There are two first-class hotels; but few boarding-houses. The facilities for buying or renting houses are very good. The expense and facility for housekeeping are about those existing in Philadelphia—very good—and rents are lower. For particulars address William S. Butler, Esq., the Mayor of Beach Haven, N. J.

For attractions there is a protected bay—Little Egg Harbor and Barnegat Bay—5 x 40 miles, easily accessible, which makes the sailing the best on the coast. Sailing and fishing are the features of the place.

The advantages of this place are the ordinary ones of the seashore, with less dampness than usual, and almost total absence of vegetation. From a personal observation of many years, this place offers more or less exemption from hay fever and periodical catarrhs.

NEW YORK.

Lake Placid, Adirondack Mountains. Situated upon Lake Placid, whose altitude is 1863 feet. The surrounding mountains are from 4000 to 5000 feet above sea-level.

The soil is pure sand and very porous; even after heavy

rains an hour of sunshine leaves the surface dry. The atmosphere is comparatively dry. Both high winds and fogs are exceptional.

A large proportion of the days are bright and sunny.

There are four first-class hotels, accommodating from 200 to 300, and smaller ones of fair accommodation, receiving from 30 to 75 guests. Also first-class cottages and camps, which can be rented by the year or season for $250 to $1000

For particulars address Reuben Clifford or Clarence Lawrence, Lake Placid, N. Y., or C. M. Noble, 26 Cortlandt Street, New York City.

The attractions are boating, fishing, hunting, mountain climbing, tennis, etc.

The mountain and lake scenery are unsurpassed. There is also a public library and reading-room.

Lake Placid is situated in the heart of the Adirondack mountains and in the lake region. It is largely a summer resort, though good accommodations may be had the year around.

The hotels and boarding-houses (except at Undercliff, care of Dr. C. D. Alton) do not take tuberculous patients. There are a number of summer "camps" upon Lake Placid which can be rented. The village has a good supply of pure water and a good sewerage system.

Keene Valley. Twenty-two miles from Westport on Lake Champlain. One of the driest and most picturesque resorts in the Adirondacks. The only sheets of water are the Ausable Lakes, six miles from the Adirondack House and three miles from St. Hubert's Inn; elevation of the latter 1360 feet. Reached *via* New York Central and D. and H. R. R. to Westport, thence by stage. There are numerous cottages.

Paul Smith's. Altitude 1623 feet.

Soil sandy loam, very porous, drying quickly after rain.

Minimum temperature 30° F., maximum temperature 80° F. There are no nights, even in midsummer, when the temperature rises above 70° F. Atmosphere usually very dry.

Occasional high winds. Fogs or mists occur in late August and September nights on all the lakes in this region, clearing as the sun rises.

Fully three-quarters of the days are bright and sunny.

There is one first-class hotel. There are no boarding-houses and only a few private cottages. Camps are situated on St. Regis, Spitfire, and Upper St. Regis lakes at various rentals, according to equipment, from $100 to $3000 for the season. Address Paul Smith's Hotel Company, Paul Smith's, Franklin Co., N. Y.

Rowing, fishing, hunting, and good roads for walking and driving.

All the advantages arising from altitude, pure water, sandy soil, dry pure air, and the surrounding heavy virgin forest of pine and balsam.

Paul Smith's hotel is only open in the summer.

Luzerne. Luzerne is situated in the southern border of the Adirondack region, 639 feet in altitude, 22 miles north of Saratoga Springs.

The soil is sandy and absorbent. There is no record of the temperature or humidity, but the atmosphere is said to be very dry.

High winds are a rarity, and there are no fogs except in the lower part of the village. The proportion of bright and sunny days is thought to be about two-thirds.

There is one first-class hotel and two first-class boarding-houses for the summer season only. Another first-class hotel is expected soon to be erected, to be open the year around. For particulars, address Stephen C. Johnson, M.D., Luzerne, N. Y.

The attractions are pleasant walks and drives and good boating on the lake.

The particular advantages claimed for this region are the pure air and water, excellent hygienic conditions, and the neighboring forests of pine, spruce, and other gummy and resinous trees.

North Carolina.

Asheville. The Asheville plateau is situated in western North Carolina, and the city of Asheville itself is 2350 feet in altitude. It is within twelve to twenty-four hours' travel of the Eastern, Southern, and Middle States. Its situation among the mountains and upon the French Broad river is very picturesque and attractive. The soil is dry and porous, and the meteorology is given in the table on page 272.

The average relative humidity for the entire year is 65 per cent., and the average number of clear and fair days for each month in the five years since the establishment of the U. S. Weather Bureau in 1888 is twenty-five. Fogs are rare, and snow rarely falls, and when it does generally disappears on the same day. The accommodations are abundant. Hotels, boarding-houses of various prices, and facilities for renting or buying comfortable houses.

For particulars apply to Dr. Karl von Ruck, Winyah Sanitarium, Asheville, N. C.

The attractions are drives in all directions, horseback riding, the Vanderbilt park, and all the various attractions of a mountain region. The city itself contains 12,000 or more inhabitants, and is extensively visited by those seeking the advantages of its climate. It is well built and offers the ordinary advantages of a city of this size.

The particular advantages of this region are freedom from severe cold weather, medium elevation, freedom from extremes of temperature or humidity, a large average of clear and fair days, easy accessibility, a relatively dry atmosphere, and attractive mountain scenery. "It has every condition favorable to out-of-door life; it is an all-year favorable locality."

THE UNITED STATES WEATHER BUREAU METEOROLOGICAL OBSERVATORY AT WINYAH SANITARIUM, ASHEVILLE, N. C.

Summary of Meteorological Records for the years from 1888 to 1891 inclusive.

Elevation, 2350 feet. Latitude, 35° 36′ N.; longitude, 82° 26′ W. Hours of observation, 7 A. M., 2 P. M., and 9 P. M.

Years.	Season.	Mean temperature.	Mean maximum temperature.	Mean minimum temperature.	Absolute maximum temperature.	Absolute minimum temperature.	Mean daily range of temperature.	Mean relative humidity.	Mean absolute humidity in grains of moisture per cubic foot of air.	Mean number of days on which 1/10 inch or more of rain fell per month.	Mean per cent. of ozone of possible amount per month.	Mean amount of rainfall in inches per month.	Direction of prevailing winds.	Mean force of wind, scale 0 to 6.
1888–89 . .	Winter .	44. 46	55. 35	35. 46	69. 50	20. 20	19. 73	60. 12	2.177	11. 5	51. 00	4. 36	N.	2. 12
1889–90 . .	"	48. 68	59. 30	37. 93	74. 30	18. 50	21. 33	64. 60	2. 585	13. 3	40. 20	4. 29	N.	2. 44
1890–91 . .	"	45. 18	55. 56	72. 68	63. 33	17. 98	20. 23	63. 40	3. 771	11. 6	56. 00	4. 23	N.	1. 80
1891–92 . .	"	44. 83	55. 11	33. 73	60. 40	16. 16	21. 37	64. 78	2. 009	11. 0	50. 10	1. 64	N.W.	1. 45
Means for 4 years	Winters .	45. 79	56. 44	44. 95	67. 38	18. 21	20. 66	63. 22	2. 633	11. 8	50. 57	3. 63	N.	1. 98
1889 . . .	Summer .	64. 97	75. 83	54. 33	85. 30	39. 50	21. 33	70. 98	4. 360	6. 5	......	2. 09	N.W.	1. 39
1890 . . .	"	65. 24	76. 00	56. 25	85. 63	45. 20	19. 73	71. 00	4. 290	9. 6	49. 40	3. 12	N.W.	1. 41
1891 . . .	"	65. 49	76. 59	54. 57	86. 60	43. 00	23. 00	68. 06	4. 230	11. 1	44. 22	3. 94	N.W.	0. 80
1892 . . .	"	67. 68	78. 63	57. 45	88. 40	46. 60	21. 00	71. 37	1. 640	9. 5	53. 42	3. 98	N.W.	1. 00
Means for 4 years	Summers	65. 89	76. 76	55. 65	86. 48	43. 30	21. 24	70. 35	3. 630	7. 4	49. 00	3. 28	N.W.	1. 12

OREGON.

Lehman Springs. Altitude 3870 feet above sea-level.

Maximum temperature 91° F., minimum 25° below zero.

No high winds and few fogs.

About two-thirds of the days in the year are bright and sunny. From April 1st to November 1st almost continuous sunshine.

Good hotel accommodations and comfortable cottages for rent. Particulars of Joseph Fullman, Pendleton, Oregon. Capacity 300.

Fine fishing and hunting for large and small game.

The pure, bracing air and spring waters claimed as the advantages of this health resort.

Wolfer's Mineral Spring, Hubbard, Marion Co. The altitude is 210 feet above sea-level.

No high winds, but foggy during the winter months.

About 55 per cent. of the days in the year are bright and sunny.

Hotel and boarding-house accommodations and facilities for buying or renting houses. Information can be obtained from William L. Grim and O. C. Byland, of Hubbard.

ANALYSIS OF WOLFER'S MINERAL SPRINGS BY PROF. FISK.

Silica	2.70
Oxide of iron and aluminum	1.00
Carbonate of lime	4.00
Carbonate of magnesia	5.00
Sulphate of magnesia	2.56
Chloride of sodium	3.50
Chloride of potassium	0.94
Total	19.70

PENNSYLVANIA.

Delaware Water Gap (a summer resort). Is situated 600 feet above the sea-level. The hotel of the highest elevation is at an altitude of 900 feet.

The atmosphere is dry, and the average temperature is about 8° below that of Philadelphia. There are occasional high winds and but little fog. The number of bright sunny

days is about the average of similar places elsewhere. There are several first-class hotels and several smaller houses. Some few houses to rent; the expense of living is small. For particulars, address the Postmaster, Delaware Water Gap, Penna.

The attractions are mountain walks of great extent and beauty, rowing on the Delaware river, fishing, hunting, bathing, drives, etc.

The particular advantage claimed for this place is that of a wholesome mountain climate with attractive scenery.

Stroudsburg is about six miles from the Gap, several hundred feet above it and in a picturesque and hilly country, and especially suited for visitors during the summer and late into the autumn. Address J. R. Foulke, Stroudsburg.

Cresson, Cambria Co. (a summer resort). The altitude of this region is from 2200 to 2500 feet.

The soil is dry and there is considerable shale formation. The mean daily temperature observed at the Mountain House is 71° F. in summer. The sun is hot during the day, temperature about 80° F.; the nights are cool, usually dry air, temperature about 65° F. At an altitude of 2500 feet dew begins to fall at about 11 P.M. and disappears about 7.30 A.M. On an average it is not heavy. There are no fogs, and high winds are exceptional.

In the matter of accommodations all classes and conditions can be suited; there are hotels with a capacity of from 500 to 50; some furnished houses to be rented and private boarding. For particulars address the Postmaster, Cresson, Pa.

The attractions are driving, fishing, hunting, and out-of-door life among varied scenery.

The particular advantages of this region are the pure air of an elevated mountainous region, pure water, accessibility, and absence of summer diseases peculiar to infants. Children and infants are said to do especially well here.

Bedford Springs, Bedford Co. Situated 1080 feet above tide, 258 miles west of Philadelphia, and 178 miles west of

Baltimore. The springs are situated one mile south of the town. The magnesia spring discharges a barrel of water a minute, and contains 41 grains of magnesium sulphate and 103 grains of calcic sulphate in each gallon. The waters act first on the kidneys, then on the bowels, liver, and skin. These waters have been used for the past eighty years for the relief of chronic bilious dyspepsia, and chronic gastric catarrh, catarrhal jaundice, and constipation. Accommodations are satisfactory.

Ebensburg, Cambria Co. Ebensburg is situated in the mountains at an elevation of 2300 feet. It is a summer resort with a cool mountain atmosphere. Fogs are rare, and fully one-half of the days in summer are sunny.

There are several first-class hotels, and facilities for renting or buying suitable houses and keeping house comfortably at small expense. Address Mr. C. H. Baker, Ebensburg, Cambria Co., Pa.

The attractions are the fine mountain scenery and air, the drives, and a small mountain lake.

The particular advantages are the altitude with the cool atmosphere.

Monterey Springs, Franklin Co. Situated in the Blue Ridge Mountains, 1500 feet above tide, forty minutes by rail from Gettysburg, and two and a half hours from Baltimore. One mile from Blue Ridge Summit Station on Western Maryland Railroad.

Minnequa, Bradford Co. Minnequa is on the line of the Northern Central Railway about equidistant from Philadelphia, New York, Buffalo, Niagara Falls, and Erie. It is situated in the midst of a rich farming and dairy country at an elevation of 1500 feet above the sea. The soil is quite porous. The maximum temperature this season is 88° F. and minimum 30° F. The average night temperature is about 45° F. The humidity is medium. There are very seldom high winds,

but always a breeze with a velocity of from one to ten miles an hour. There are no fogs during the summer and very seldom in the winter. About 80 per cent. of the days are bright and sunny.

There is one first class hotel and several private cottages. A good opportunity to buy lots for building purposes at reasonable rates. For particulars address M. D. Crocker, Williamsport, Pa., or S. N. Manley, Minnequa, Pa.

The attractions are the picturesque scenery, drives, and walks; Mt. Pisgah, within easy driving distance, with a fine view; Mountain Lake eleven miles distant; Armenian Mountain two miles distant. There are also opportunities for tennis, golf, and ball.

The especial advantages claimed for this region are the mountain air, fine scenery, and the Minnequa Spring, the analysis of which is as follows:

ANALYSIS OF MINNEQUA SPRING WATER.

	Grains in 1 U. S. gallon.		Grains in 1 U. S. gallon.
Total solids	7.652	Chlorine	0.140
Calcium	0.994	Silica	0.700
Magnesium	0.207	Zinc	0.028
Sodium	0.722	Carbonic acid	2.053
Lithium	trace	Boric acid	2.132
Aluminium	0.127	Oxygen (with silicates)	0.138
Iron	trace	Loss	0.145
Manganese	0.229		

Temperature of spring, 47° Fahr. Amount of sample, 25 U. S. G.

There is no resident physician at present, and as yet it is only a summer resort, being kept open from June 1st to October 1st.

Glen Summit, Luzerne Co., situated in Fairview Township, Pa., on the northern slope of the eastern end of Nescopeck Mountain, The point where the hotel and cottages are situated is 2000 feet above the sea-level. The soil is dry and porous; these mountains are formed of the grayish-white Pocono sandstone, which consists of a lower portion of pebbly conglomerate and upper part of medium to gritty sandstone. The mountains are of gradual slope and covered with vegetation to the summit. There are no statistics as to temperature, but it is said to be about 15° F. less than near the coast.

"The atmosphere is marked by its purity and dryness." There are no fogs, and the winds are rarely high during the summer months. Bright and sunny days are the rule, and generally there is a great preponderance of clear days, and the sunsets are very fine.

There is a first-class hotel with excellent table, and very comfortable cottages in the neighborhood. Occasionally opportunities are offered for obtaining a cottage for the season at a moderate rental. Address Mr. J. E. Patterson, 71 North Franklin Street, Wilkes-Barre, Pa., or W. H. Crosby, Glen Summit, Pa.

The attractions are the smooth red shale walks and drives of about fifty miles in the aggregate. There is an artificial lake from the outflow of the Great Indian Sand Spring, situated about a mile from the hotel. Crystal Lake, about three miles away, with boating, fishing, etc. Trout streams in the neighborhood.

The particular advantages claimed for this region are the pure air, water, and hygienic surroundings of the place. The Glen Summit Spring water is said to be exceedingly pure, containing less than two grains of salts to the gallon; it is entirely free from organic matter, and there is no possible source of contamination from surface drainage; the analysis is as follows:

WILKES-BARRE, March 17, 1896.

MR. J. E. PATTERSON.

DEAR SIR: The following is the result of the analysis of the sample of water taken by me on February 18, 1896, from your spring at Glen Summit, Pa., known as "Glen Summit Spring:"

	Parts in 100,000.	Grs. per U. S. gal.
Free ammonia	0.0014	0.0008
Albuminoid ammonia	0.0000	0.0000
Nitrogen as nitrates	0.0026	0.0015
Sodium chloride	0.3940	0.2297
Silica	0.1950	0.1137
Oxide of iron and aluminium	0.0550	0.0321
Sulphate of lime	0.3436	0.2011
Carbonate of lime	0.3394	0.1979
Total solids	1.9900	1.1602
Loss on ignition	0.5700	0.3323

This is a soft water of a high degree of purity, and will keep unchanged for an indefinite length of time. (W. H. Dean.)

The society at the hotel and cottages is of the best character. The charter of the hotel forbids the sale of intoxicating liquors on the premises, and none can be sold on the grounds of the company upon which the cottages are erected, comprising 550 acres.

This place is said to be especially beneficial for cases of hay fever, chronic malaria, neurasthenia, insomnia, dyspepsia, gout, and rheumatism.

South Dakota.

Hot Springs, Fall River Co. Altitude 3450 feet. The surrounding mountains rise 1500 feet higher.

Soil dry and porous.

Average temperature for June, July, and August for eight years 62° F.; for December, January, and February 29° F. Relative humidity 60. Per cent. of cloudiness 21. Annual precipitation seventeen inches.

Seldom have high winds. No fogs, and dews are rare. The nights are cold.

About 80 per cent. of the days in the year are bright and sunny.

First-class hotel accommodations; the hotels are ten in number; a few cottages to be rented. Capacity for guests 4000. Particulars from Harry D. Clark, Hot Springs, S. D., Edward Hungerford, Hot Springs, S. D., and A. J. Hoenes, M.D.

Out-of-door attractions consist of walking, riding, driving, and excursions into the surrounding country.

The dry, pure air, fine scenery, medium altitude, and pleasant location, together with the water for bathing and drinking, and well-equipped bath-houses, are claimed as advantages of this health resort.

Analysis of Min-ne-kah-ta Spring by Charles B. Gibson.

	Grs. per gallon.
Silica	2.464
Calcium sulphate	16.325
Peroxide of iron	trace
Magnesium sulphate	4.320
Sodium and potassium sulphate	25.620
Sodium chloride and potassa	13.790
	62.546

In connection with the Catholicon Spring is conducted a sanitarium.

analysis of the Catholicon Spring by E. C. Smith.

	Grs. per gallon.
Potassium chloride	1.370
Sodium chloride	9.747
Calcium sulphate	127.457
Magnesium sulphate	11.509
Magnesium bicarbonate	13.282
Iron bicarbonate	0.279
Alumina	0.058
Silica	1.131
Total	164.833

South Carolina.

Harris Lithia Spring, Harris Spring, Laurens Co.

Temperature in winter from 30° to 35° F., in summer from 70° to 85° F. Atmosphere is dry.

Neither high winds nor fogs.

Most of the days in the year are bright and sunny.

Good hotel and cottage accommodation. Capacity for guests 200. For information address Dr. J. Q. Wilber, Waterloo; Dr. J. H. Miller, Cross Hill; Dr. O. B. Mayer, Newberry; Dr. Thomas McCoy, Laurens.

Hunting, etc., are the out-of-door attractions.

The location is in the Piedmont section of South Carolina, and, besides the lithia spring, has sulphur, chalybeate, and magnesia springs.

Tennessee.

Idaho Springs, St. Bethlehem, Montgomery Co. The altitude is about 237 feet above sea-level.

Maximum temperature is 94° F. The average summer temperature is given as 76° F.

Few high winds and fogs.

About 70 per cent. of the days in the year are bright and sunny.

There are first-class hotels and boarding-houses; also facilities for renting houses. Capacity 100 to 200. For particulars address N. C. Merritt and W. W. Burkadale.

Fishing, hunting, etc., are the out-of-door attractions.

The high and dry location is claimed to be an advantage as a health resort.

Red Boiling Springs, Macon Co. The altitude is 1200 feet above sea-level.

The soil is comparatively dry and very porous.

High winds and fogs are rare.

The greater number of days in the year are bright and sunny.

There is one first-class hotel and several boarding-houses. Particulars can be obtained from R. W. Hudson. Capacity for guests 300.

The out-of-door attractions are hunting, fishing, etc.

Tate Epsom Spring, Tate Spring, Grainger Co. The altitude is 1400 feet.

ANALYSIS OF TATE SPRING, EAST TENNESSEE, BY DR. T. S. ANTISELL.

Sulphate of lime	160.66	grains.
Sulphate of magnesia	32.91	"
Sulphate of soda	8.50	"
Sulphate of potassa	1.54	"
Chloride of sodium	40.27	"
Chloride of iron	2.99	"
Chloride of manganese	0.62	"
Iodide of sodium	traces	
Phosphate of lime	1.14	"
Carbonate of lime	21.56	"
Silica	2.70	"
Nitric acid	0.02	"
Total	272.91	grains.

The soil is dry and porous. The maximum temperature is 90° F., the minimum is 20° F.

No high winds nor fogs.

About 314 days in the year are bright and sunny.

First-class hotels and facilities for buying houses. Information can be obtained from Thomas Tomlinson, Tate Springs, Tenn. Capacity for guests is 600.

The out-of-door attractions consist of hunting, fishing, driving, etc.

The advantages claimed for this region as a health resort are its altitude, fine dry air, and pure water.

TEXAS.

El Paso. Situated in the extreme western corner of the State within three miles of the southern boundary line of New Mexico. It is protected on the west, north, and south by a main spur of the Rocky Mountains and a slightly elevated plateau on the east side extending some sixty or seventy miles. It is a city of 11,000 inhabitants. It has an elevation of 3764 feet, and the soil is exceedingly dry and porous.

For the years 1887 and 1888 the record of temperatures is as follows, for the months named:

	Mean.			Max. Below 32°.
	7 A.M.	3 P.M.	11 P.M.	Days.
January	36	53	44	0
February	41	60	50	0
March	67	56	45	0
April	51	75	63	0
October	53	75	62	0
November	41	61	49	0
December	38	56	46	5

There are first-class hotels and boarding-houses, and facilities for renting and buying suitable houses and keeping house comfortably at reasonable expense. Address H. B. Stevens, El Paso, Texas.

The attractions are driving over good roads and mountain climbing.

The especial advantages claimed for this region are a dry, warm air in the daytime, cool or cold bracing nights with rare excessive cold, moderate winds, cloudless skies, medium altitude, absence of malaria.

"Speaking from personal observation," says Dr. W. M.

Yandell, Health Officer of El Paso, "an almost perfect climate. I confidently recommend El Paso from the middle of September to the middle of May, camping out in the mountains of New Mexico after that time."

The rainfall for the months of January, February, and December, from 1881 to 1886 is as follows, computed in hundredths of an inch:

	1881	1882	1883	1884	1885	1886
January .	0.21	0.42	0.08	0.36	0.06	0.21
February .	0.10	0.37	0.14	0.56	0.02	0.44
December	0.62	0.00	0.55	0.50	0.26	0.04

The mean relative humidity from September 1st to May 1st for a number of years is 49.

High winds are rare and fogs practically unknown.

In the eight months named the average number of cloudy days for a series of years was as follows:

	Average No. of cloudy days.		Average No. of cloudy days.
January	3.0	September	2.8
February	3.0	October	1.7
March	3.2	November	2.9
April	1.5	December	2.8

An average of 20.9 cloudy days in the eight months named or an average of 2.6 cloudy days per month.

UTAH.

Castilla Hot Springs, Castilla, Utah Co. Altitude is 4920 feet above sea-level.

Soil very dry during summer.

No high winds nor fogs.

About 330 days in the year are bright and sunny.

Good hotel accommodations; capacity 75.

Good hunting, and fishing for mountain trout.

The advantages claimed for this region are the fresh mountain air, the fine Utah climate, and the mineral water for bathing.

VERMONT.

Burlington. Situated in the northern part of Vermont upon Lake Champlain, at an elevation of 377 feet.

Meteorological Observations, City of Burlington, Vermont. By Charles E. Allen.

Hours of observation, 7 A.M., 1 P.M., and 9.30 P.M.

Showing the maximum and minimum temperature and the range of temperature at hours of observation for the year 1895; the mean range of each month in the year, and the mean monthly, annual, and general average.

	Jan.			Feb.			March.			April.			May.			June.		
	Max.	Min.	Range.	Max.	Min.	Range.	Max.	Min.	Range.	Max.	Min.	Range.	Max.	Min.	Range.	Max.	Min.	Range.
1895	37	-14	51	51	-19	70	45	3	42	67	23	44	86	36	50	85	56	29
1840–1895	44	-12	56	45	-16	61	55	4	49	69	20	49	80	40	40	88	47	41

	July.			Aug.			Sept.			Oct.			Nov.			Dec.			
	Max.	Min.	Range.	Max.	Min.	Range.	Max.	Min.	Range.	Max.	Min	Range.	Max.	Min.	Range.	Max.	Min.	Range.	
1895	88	55	33	88	55	36	87	41	46	75	26	39	66	10	56	56	-8	64	46.60 *a*
1840–1895	90	55	35	86	50	36	78	38	40	71	30	40	58	13	45	45	-10	55	45.49 *b*

Mean Monthly Average of Temperature.

1895	21.14	17.15	26.25	43.38	60.50	70.20	68.50	68.90	61.09	46.37	38.93	28.93	46.03 *c*
1840–1895	19.33	21.05	28.73	43.40	57.68	67.21	71.05	68.19	61.00	49.10	36.60	25.33	45.70 *d*

Monthly Precipitation.

1895	1.31	1.16	0.77	1.65	0.79	2.78	2.46	4.84	3.64	0.23	4.32	1.74	28.69 *e*
1840–1895	1.83	1.52	1.81	1.61	3.08	3.31	3.96	3.52	3.45	3.43	4.26	1.89	33.67 *f*

a Mean monthly average, 1895.
b Mean annual average, 1840 to 1895.
c Mean annual temperature for 1895.
d Mean average, 1840 to 1895.
e Total inches for 1895.
f Mean annual average, inches.

The soil is generally dry and sandy.

There is a good deal of high wind and no fogs. The proportion of bright and sunny days is said to be large.

There are two large hotels, but not first-class ones, when compared with the standard of large summer resort hotels. First-class boarding-houses and facilities for renting or buying comfortable-houses. Address B. S. Jones, 254 South Union Street, or H. R. Conger, 136 Church Street, Burlington, Vt.

The attractions are in summer, yachting, rowing, canoeing, swimming, riding, driving, bicycling. In the winter, sleighing, coasting, tobogganing, snow-shoeing, skating, ice-boating. Burlington is a small city with good society ; is the seat of the University of Vermont, and offers the usual in-door attractions.

The advantages of this region are its wholesome climate, the mortality being 16.38 per cent., and its favorable situation west of the Green Moun tains upon Lake Champlain, beyond which the Adirondack Mountains are visible.

WISCONSIN.

Palmyra Springs, Palmyra, Jefferson Co., Wisconsin. Altitude is 850 feet.

ANALYSES OF SPRINGS AT PALMYRA SPRINGS.

	Grains per gal.	Grains per gal.	Grains per gal.	Grains per gal.
Sulphate of sodium	0.9395	....	....	....
Sulphate of potassium	0.2284	....	....	....
Bicarbonate of calcium	15.6937	....	....	....
Bicarbonate of magnesia	10.9408	7.9150	10.1439	6.477
Chloride of magnesium	0.1779	....	....	....
Bicarbonate of iron	0.0518	....	....	....
Phosphate of calcium	trace	....	....	....
Alumina	0.0514	0.1872	0.2223	trace
Silica	0.7005	0.6142	0.9067	0.726
Organic matter	trace	0.3451	....	....
Chloride of sodium	....	0.2106	0.4270	....
Sulphate of soda	....	0.6435	0.3978	0.278
Bicarbonate of soda	....	0.1638	0.1813	1.567
Sulphate of lime	....	0.3042	0.7956	0.334
Bicarbonate of lime	....	9.8572	12.8466	9.013
Bicarbonate of protoxide of iron	....	0.0643	....	0.334
Oxide of iron	....	....	....	....
Total	....	20.3051	25.9212	18.689

Soil is very sandy and dry.

Seldom have high winds, and never fogs.

A large number of the days in the year are bright and sunny.

Sanitarium, with capacity for 200 guests.

Out-of-door attractions consist of boating, fishing, driving, etc.

The advantages of the place as a health resort are its dry climate, pure air, and water from a variety of springs, absence of radical weather changes, and large number of sunny days. The great geyser spring has a flow of 10,000,000 gallons per day. References made to John Goza and E. Wilson.

Shealtiel Mineral Springs, Waupaca, Waupaca Co. The altitude is 899 feet above sea-level.

The soil is a dry, sandy, and porous loam. Maximum temperature during summer 90° F., minimum in summer 60° F.

No high winds nor fogs.

At least 300 of the days in the year are bright and sunny. Through the summer there are occasional showers. Nights are usually cool.

Good hotel and cottage accommodations; also facilities for renting cottages at reasonable expense. Capacity for guests 300 to 400.

Boating on a continuous chain of fourteen lakes, fishing, etc., comprise the out-of-door attractions.

The pure air, mineral water, even temperature, absence of severe storms, and absence of sudden changes are claimed to be advantages of the place as a health resort.

ANALYSIS OF SHEALTIEL MINERAL SPRINGS BY GUSTAVUS BODE.

	Grs. per gal.
Chloride of sodium	0.1638
Sulphate of soda	0.1930
Bicarbonate of soda	0.7546
Bicarbonate of lime	6.4350
Bicarbonate of magnesia	6.3648
Bicarbonate of protoxide of iron	0.0468
Alumina	0.0877
Silica	0.6025
Organic matter	0.0000
Total	14.6482

INDEX.

D indicates remarks in discussion of papers.